DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

TM 11-2226
TO 31W4-2FG-181

TELETYPEWRITER REPERFORATORS TT-107/FG, TT-107B/FG AND TT-109/FG

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

MAY 1957

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the 115-volt motor circuits. Serious injury or death may result from contact with these circuits. Turn off the power and discharge all high-voltage capacitors before making any connections or replacing any parts inside the equipment.

DON'T TAKE CHANCES!

TECHNICAL MANUAL
No. 11–2226
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DEPARTMENTS OF THE ARMY AND
THE AIR FORCE
WASHINGTON 25, D. C., *16 May 1957*

TELETYPEWRITER REPERFORATORS

TT–107/FG, TT–107B/FG, AND TT–109/FG

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*This manual supersedes TM 11–2226, 7 July 1955, and TM 11–2273, 5 May 1955.

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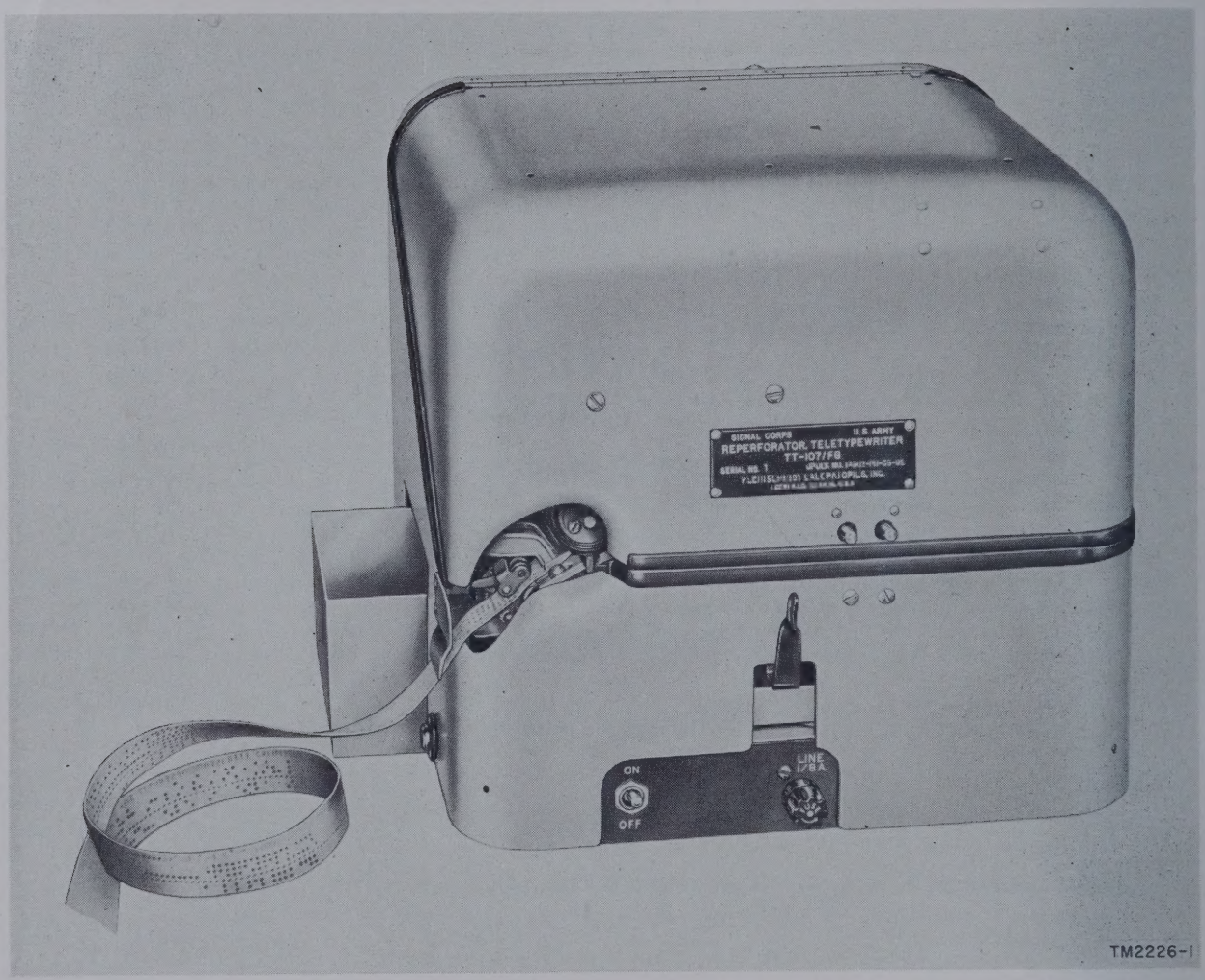


Figure 1. Teletypewriter Reperforator TT–107/FG, less running spares.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual contains information on the description, installation, operation, theory, maintenance, and repair of Teletypewriter Reperforator TT–107/FG, Teletypewriter Reperforator TT–107B/FG, and Teletypewriter Reperforator TT–109/FG.

b. Official nomenclature followed by (*) (for example, TT–107 (*)/FG) is used to indicate Teletypewriter Reperforator TT–107/FG and Teletypewriter Reperforator TT–107B/FG. The term *reperforator* is the common name used in this manual for Teletypewriter Reperforator TT–107/FG, Teletypewriter Reperforator TT–107B/FG and Teletypewriter Reperforator TT–109/FG. The information in this manual is applicable to all three equipments unless specific reference is made to a given equipment.

c. Forward all comments on this publication directly to Commanding Officer, U. S. Army Signal Publications Agency, Fort Monmouth, N. J.

2. Forms and Records

a. Unsatisfactory Equipment Reports.

(1) Fill out and forward DA Form 468 (Unsatisfactory Equipment Report) to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, New Jersey, as prescribed in AR 700–38.

(2) Fill out and forward AF TO Form 29 (Unsatisfactory Report) to Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AF TO 00–35D–54.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700–58 (Army) and AFR 71–4 (Air Force).

c. Preventive Maintenance Forms. Prepare DA Form 11–252 (fig. 15) (Operator First Echelon Maintenance Check List for Signal Corps Equipment (Teletypewriter)) or DA Form 11–253 (fig. 16) (Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Teletypewriter)) in accordance with instructions on the back of the form.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Teletypewriter Reperforators TT–107/FG, TT–107B/FG, and TT–109/FG are receive only, lightweight reperforators which print and perforate on a 7/8-inch paper tape.

b. The reperforators are used in fixed station and mobile communications centers to receive start-stop 5-unit code impulses from the signal circuits. The reperforators may be used as follows:

(1) As line terminating equipment for a dc signal line (A, fig. 2).

(2) With teletypewriter page printing equipment when either monitor or tape copy is required (B, fig. 2).

(3) Directly to carrier or radio telegraph systems with or without Telegraph Terminal TH–5/TG or other converter equipment (C, fig. 2).

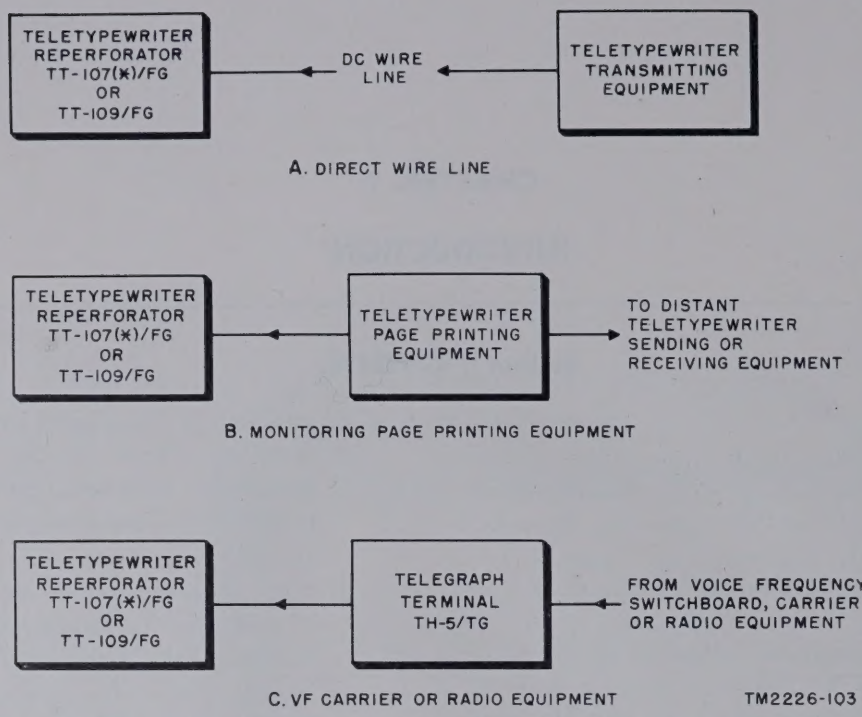

TELETYPEWRITER REPERFORATOR TT-107(*)/FG OR TT-109/FG
DC WIRE LINE
TELETYPEWRITER TRANSMITTING EQUIPMENT
A. DIRECT WIRE LINE
TELETYPEWRITER REPERFORATOR TT-107(*)/FG OR TT-109/FG
TELETYPEWRITER PAGE PRINTING EQUIPMENT
TO DISTANT TELETYPEWRITER SENDING OR RECEIVING EQUIPMENT
B. MONITORING PAGE PRINTING EQUIPMENT
TELETYPEWRITER REPERFORATOR TT-107(*)/FG OR TT-109/FG
TELEGRAPH TERMINAL TH-5/TG
FROM VOICE FREQUENCY SWITCHBOARD, CARRIER OR RADIO EQUIPMENT
C. VF CARRIER OR RADIO EQUIPMENT
TM2226-103

Figure 2. Typical application, block diagram.

4. Technical Characteristics

The technical characteristics listed below are identical for the TT–107/FG, the TT–107B/FG, and the TT–109/FG, except for the type of motor and the power requirements.

Type of characters	English, standard communication symbols.
Method of recording	Message printed and perforated on ⅞-inch paper tape.
Type of tape feed	Sprocket.
Signaling code	Five-unit, start-stop; stop impulse equals start impulse length multiplied by 1.42.
Type of signals	Neutral (20- or 60-ma) or polar (15- or 30-ma).
Speed:	
Operations per minute (opm).	368.1, 404, 460, or 600.
Words per minute (wpm).	60, 66, 75, or 100.
Service range (direct wire line):	
368.1	25 miles.
600 opm	15 miles.
Motor:	
Power requirements:	
TT–107(*)/FG	120w, 115v, single phase, 60 cps.
TT–109/FG	150w, 105–125v, single phase, 50–60 cps.
Motor—Continued	
Speed (all models)	3,600 rpm (±5 percent).
Type:	
TT–107(*)/FG	Synchronous.
TT–109/FG	Series-governed.
Line current requirements:	
Dc line	60 ma dc.
Voice-frequency line	20 ma dc.
Polar line	Not more than 30 ma dc.
Tape capacity	Enough tape for— 5 hours, 20 minutes at 368.1 opm. 3 hours, 10 minutes at 600 opm.
Distortion tolerances:	
Bias tolerance:	
368.1 opm	40 percent (maximum).
600 opm	35 percent (maximum).
End-distortion tolerance:	
368.1 opm	35 percent marking or spacing.
600 opm	30 percent marking or spacing.
Range adjustment (for received signal bias and end distortion).	Scale calibrated 0 to 120; 100 scale units equal width of 1 unit signal pulse (22 milliseconds at 368.1 opm).
Bias potentiometer	Adjusts current flow in selector magnet bias windings.

Radio-frequency suppression.	Teletypewriter does not interfere with radio reception at frequencies between .35 and 150 megacycles when located 2 ft or more from radio antenna.
Safety shielding	Points at which potentials of 30 volts or more exist are shielded against accidental contact by personnel.
Total weight of installed equipment.	37 lb with full roll of tape.
Space requirements of installed equipment.	1½ cu ft.
Temperature limits:	
Equipment in use	+32° F. (0° C.) to +132° F. (+55.6° C.).
Equipment in storage.	−80° F. (−62.2° C.) to +160° F. (+71.1° C.).
Minimum barometric pressure:	
(Operating)	16.88-in. mercury (equivalent to 15,000-ft altitude).
Other climatic conditions	Equipment withstands high humidity and moisture as encountered in tropics.

5. Table of Components

The components of Teletypewriter Reperforator TT–107(*)/FG and TT–109/FG are as follows:

Quantity	Item	Height (in.)	Depth (in.)	Width (in.)	Unit weight (lb.)
1	Reperforator unit with dust cover	12 5/16	12 5/8	12¼	37
	For TT–107/FG only	12 5/16	12 5/8	12¼	37
	For TT–107B/FG only	11 11/16	12 7/8	12 1/16	37
	For TT–109/FG only	13½	12 7/8	12 1/16	37. 5
1	Chad bin	3 3/16	3. 92	2 31/32	
1	Inking ribbon		½		
1	Message tape		⅞	7¼	1. 5
2 oz	Ink (TT–107/FG only)				
1	180 vps tuning fork (TT–109/FG only)				
1	Worm (600 opm)	¾	1¼		
1	Worm gear (600 opm)	13/16	2 1/20		
2	TM 11–2226	10¼		7⅞	
1	Set running spares (par. 7).				

6. Description of Teletypewriter Reperforators TT–107/FG, TT–107B/FG, and TT–109/FG.

The reperforators consist of a tape-printing and punching mechanism and a tape supply reel mounted on a base frame. A rectangular dust cover, hinged along the upper rear edge, tilts upward to provide access to the internal mechanisms. A terminal box, housed within the base frame contains most of the electrical components of the reperforator. A power switch, line fuse holder (TT–107/FG only), and a tape feed out lever are mounted on the front of the reperforator and extend through cutouts in the front of the dust cover. The power cord, receive cord, and two POWER fuseholders extend from the back of the terminal box and are accessible through cutouts in the rear of the dust cover. A chad box extends through a cutout in the left side of the dust cover.

7. Running Spares

a. TT–107/FG Running Spares.

Item	Quantity
Fuse, ⅛ amp, 250 V	5
Fuse, 1.6 amp, 250 V	5
Copy lamp, 15 W, 120 V	1
Paper tape	4

b. TT–107B/FG and TT–109/FG Running Spares.

Item	Quantity
Fuse, 1.6 amp, 250 V	5
Copy lamp, 150 W, 120 V	1
Paper tape	4
Inking ribbon	1

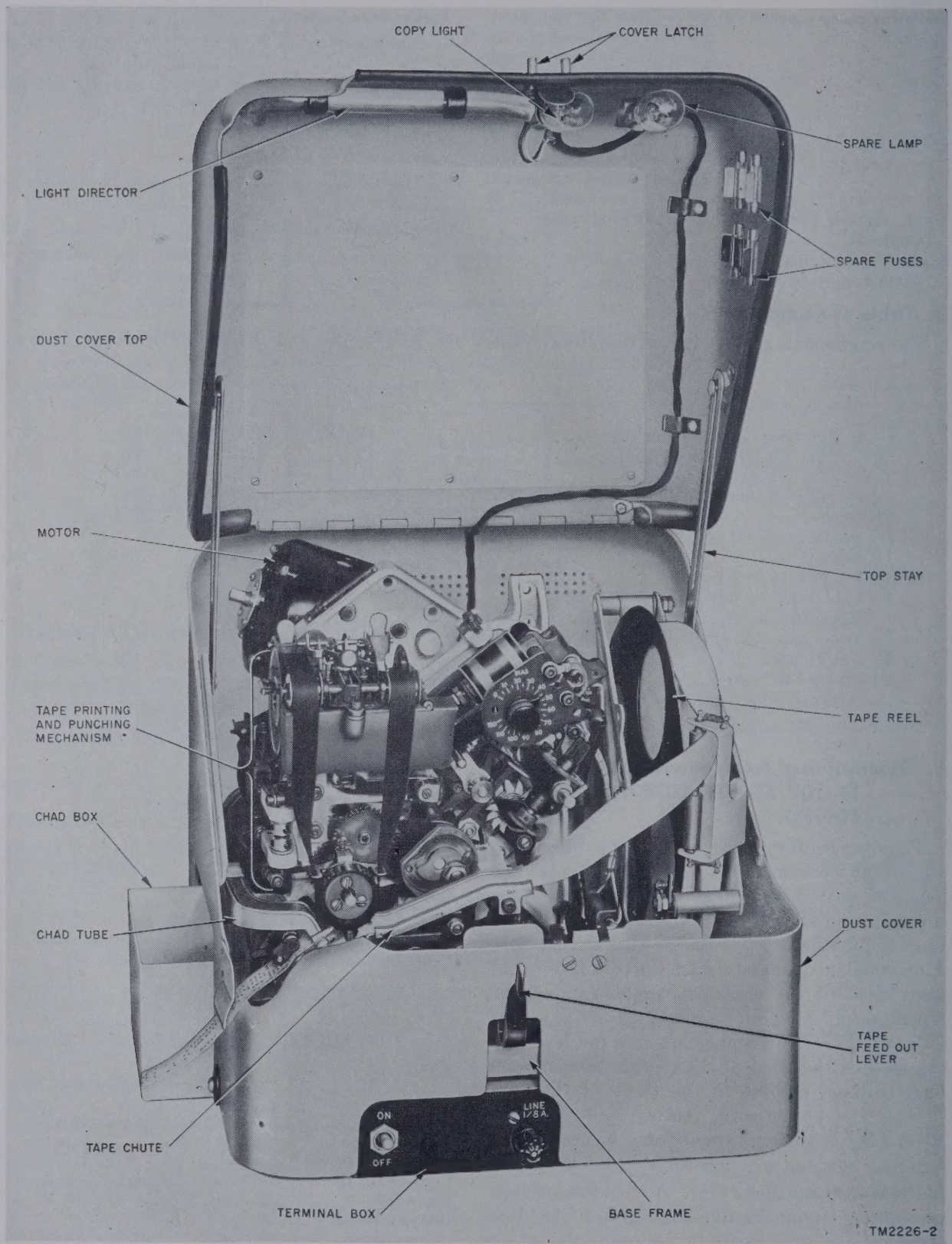


Figure 3. Teletypewriter Reperforator TT–107/FG, dust cover open.

8. Differences in Models

Item	Teletypewriter reperforator TT–107/FG	Teletypewriter reperforators TT–107B/FG and TT–109/FG
Motor type	Synchronous	Synchronous (TT–107B/FG); series governed (TT–109/FG).
Rangefinder locking facilities	Knurled nut and lockwasher or spigot type dial lock.	Spring loaded dial detent.
Friction clutch spring tension adjusted by.	Positioning collars retained by setscrews.	Adjusting collars secured by two machine screws with micro-adjustment feature.
Selector Y-levers held in position by	Friction plates	Y-lever detents.
Tape roll	Nonremovable reel, alarm lever rides against top of paper tape roll.	Removable reel, alarm lever rides against bottom of paper tape roll.
Tape roll retainer	Support arm latched in position	Circular plate locked by tabs and slots.
Tape puller mechanism	Not included	Mounts on front support frame in front of the rangefinder.
Potentiometer adjustment facilities	BIAS potentiometer knob	Locked in optimum position.
Ribbon spool retaining device	U shaped holding clip	Locking clips at each end of ribbon spool shaft.
Bearing retainers	All bearings retained in frames or support brackets.	One bearing block on front support frame; bearings retained by clamping screws in rear frame.
Tape tear wire	Not included	On code die support.
Tape guide lever and position indicator.	Not included	Mounted on code die assembly.
Code-ring cage adjustable fulcrums	Spade shaped	Hook shaped, mounted on eccentric studs.
Main shaft driven gear	Pinned to shaft	Keyed to shaft.
Ink reservoir	Mounts on bracket of ribbon supply	Not included.

CHAPTER 2

INSTALLATION

Section I. SERVICE ON RECEIPT OF EQUIPMENT

9. Siting

When selecting a suitable location for installing Teletypewriter Reperforator TT–107(*)/FG or TT–109/FG, consider the following:

a. Power. A 115-volt ac power supply (par. 13*d*) capable of providing at least 150 watts of power is needed for operating the motor and rectifier. If Telegraph Terminal TH–5/TG (TM 11–2239) or other line-terminating device is to be used, the power requirements must be increased accordingly.

b. Space Requirements. Leave enough space in front of the equipment for operating personnel to move about freely. Allow at least 10 inches at the back of the equipment for installation and maintenance purposes.

c. Lighting. Provide adequate lighting for operating personnel.

10. Unpacking.

a. Packaging Data.

(1) *TT–107/FG.*

(*a*) When packed for domestic shipment (A, fig. 4) the reperforator and accessories are packed in separate corrugated fiberboard cartons. The two cartons are placed in a single wooden shipping container 18 inches long, 24 inches wide, and 16 inches deep. The assembled package occupies approximately 4.1 cubic feet and weighs approximately 68 pounds.

(*b*) When packaged for export shipment (B, fig. 4) the packaging is identical to that described in (*a*) above except that the fiberboard carton containing the reperforator is wrapped in waterproof barrier material and the packaged reperforator and accessory pack are placed in a second corrugated carton before being placed in the wooden shipping container. The shipping container is 20 inches long, 25¾ inches wide, and 18 inches deep and occupies approximately 5.4 cubic feet. The weight of the package unit is approximately 75 pounds.

(2) *TT–107B/FG and TT–109/FG.* The TT–107B/FG and TT–109/FG have one standard packing arrangement for both domestic and export packaging. When prepared for shipment (fig. 5) the reperforator and accessory pack are packed separately in corrugated fiberboard cartons. The two cartons are placed in a single wooden shipping container 25 inches long, 20 inches wide, and 20 inches deep. The shipping container occupies approximately 5.8 cubic feet and weighs approximately 77 pounds.

b. Removing Contents. Follow the procedure described below. Omit those steps that are not applicable to the type of packaging encountered.

(1) Cut and fold back the metal bands.

(2) Remove the nails from the wooden shipping container and remove the cover.

(3) Carefully lift the cartons from the wooden shipping container.

(4) Open the carton by slitting the top along three edges, permit the fourth edge to act as a hinge.

(5) Carefully cut the waterproof barrier material and remove the inner carton.

(6) Open the inner carton and grasp the reperforator by the wooden shipping base. *Do not* lift the reperforator by grasping the cover.

(7) Remove the accessory pack. Open it as described in (4) above.

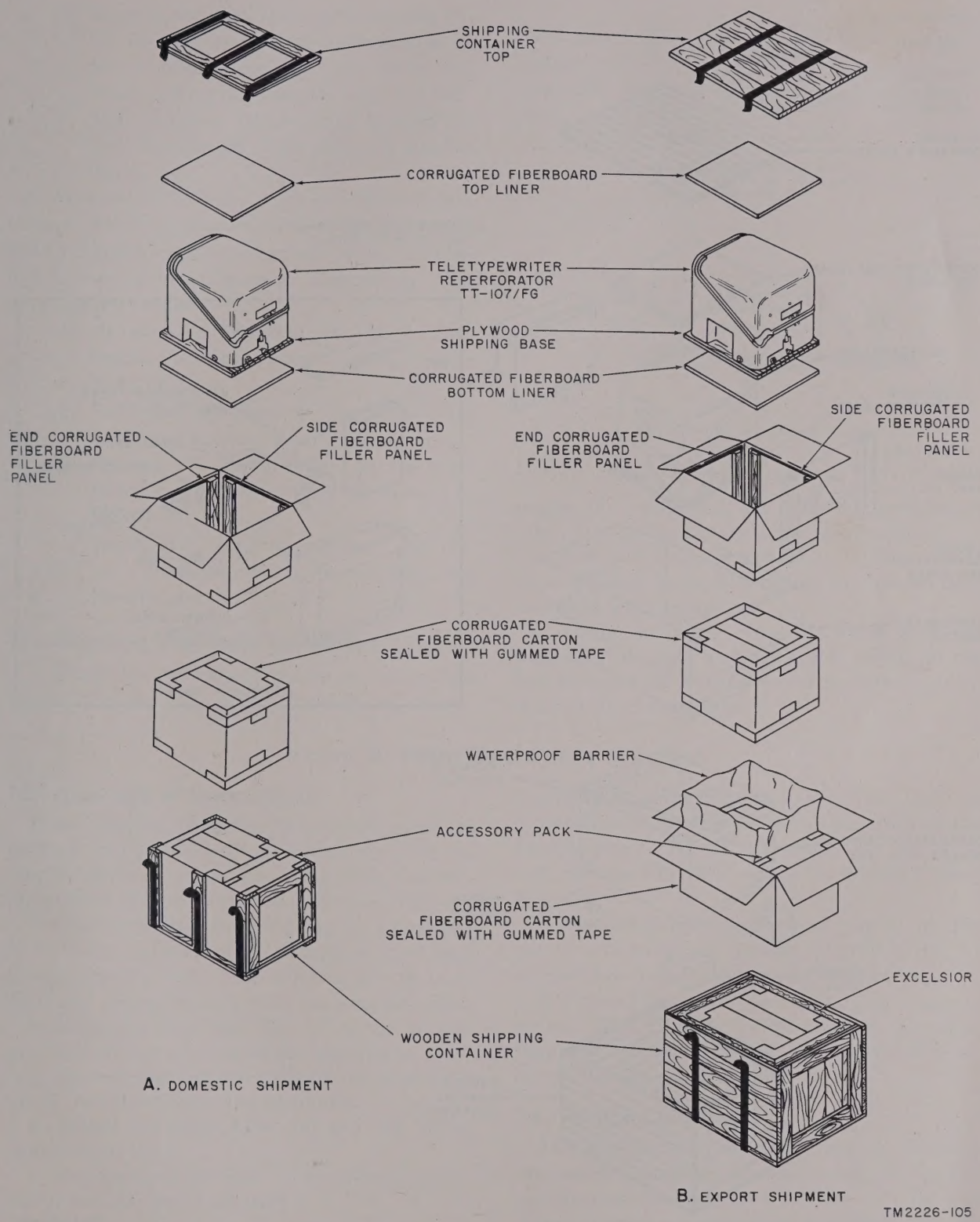


Figure 4. TT-107/FG packaged for domestic and export shipment.

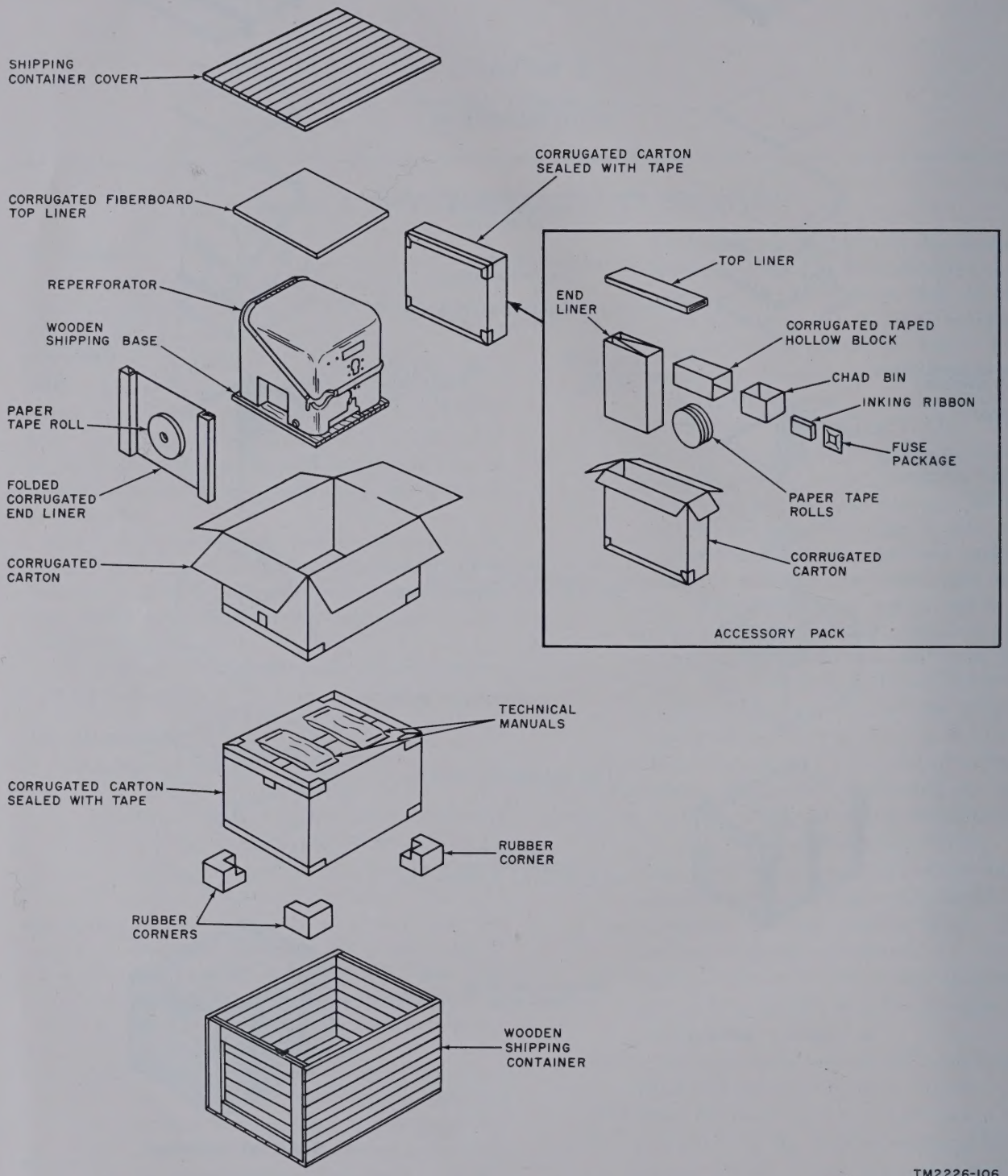


Figure 5. TT–107B/FG or TT–109/FG packaged for shipment.

(8) Remove the nuts, bolts, and washers (A, fig. 6) that secure the reperforator to the wooden shipping base. Save the wooden shipping base for use as a template to locate the mounting holes in the final installation of the unit on a table or bench.

c. Removal of Shipping Spacers (TT–107/FG Only.) Shipping spacers between the base frame and the reperforator casting must be removed before installing the equipment. Remove the shipping spacers as follows:

(1) Remove the four nuts (B, fig. 6) that fasten the reperforator casting to the base frame.

(2) Lift the reperforator from the base frame and remove the shipping spacers.

(3) Replace the reperforator on the base frame and secure it with the nuts ((1) above).

(4) Store the shipping spacers for reuse when repacking or storing the reperforator.

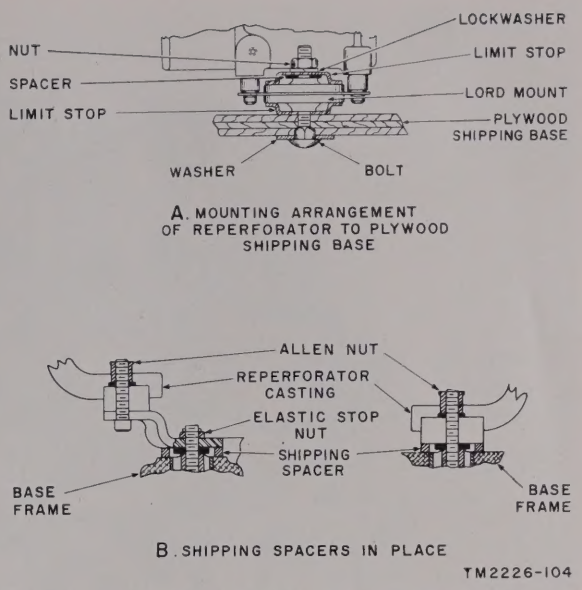


Figure 6. Removal of shipping spacers (TT–107/FG only)

11. Checking Unpacked Equipment

a. Check the contents of the boxes against the master packing list. If no packing list accompanies the equipment, the table of components (par. 5) may be used as a general checklist.

b. Examine each component to be sure that it is complete, is in good condition, and has not been damaged during shipment.

c. If the equipment does not check with the packing lists, or if any damage is noted, fill out and forward DD Form 6 according to the instructions given in paragraph 2.

Section II. PREINSTALLATION SERVICES

12. Assembly of Components

When shipped from the factory, all parts are fastened in their operating position with the exception of the chad box, paper tape roll, and inking ribbon. Install these components as follows:

a. Use the wooden shipping base as a template to mark the top surface of the table or shelf used to support the unit. Cut holes in the table or shelf and secure the unit with the bolts provided.

b. Hang the chad box (fig. 7) on the bracket provided on the left side of the base frame.

c. Remove the dust cover by lifting it straight up off the rubber mounting grommets.

d. Install the paper tape roll and the inking ribbon (par. 22).

e. Replace the dust cover on the rubber mounting grommets; seat it securely.

13. Ground and Power Connections

a. See that the 1.6-amp fuses (fig. 8) are installed in the fuse holders at the rear of the reperforator. See that the ⅛-amp fuse (fig. 10) is installed in the fuse holder at the front of the reperforator (TT–107/FG only).

b. Set the POWER switch in the OFF position.

c. Connect the braided metal pigtail on the power cord to a cold waterpipe, ground rod, or similar low resistance ground connection.

d. Connect the power cord to the power supply outlet. The TT–107(*)/FG requires 115 volts, regulated, 60 cycle ac and the TT–109/FG requires 105–125 volts, 50–60 cycle ac.

14. Friction Clutches

The reperforator uses two friction clutches: the selector camshaft friction clutch (6, fig. 21) and the function shaft friction clutch (11, fig. 20). These friction clutches were lubricated and adjusted by the manufacturer prior to shipment. However, they should be checked for proper lubrication and adjustment to make sure these condi-

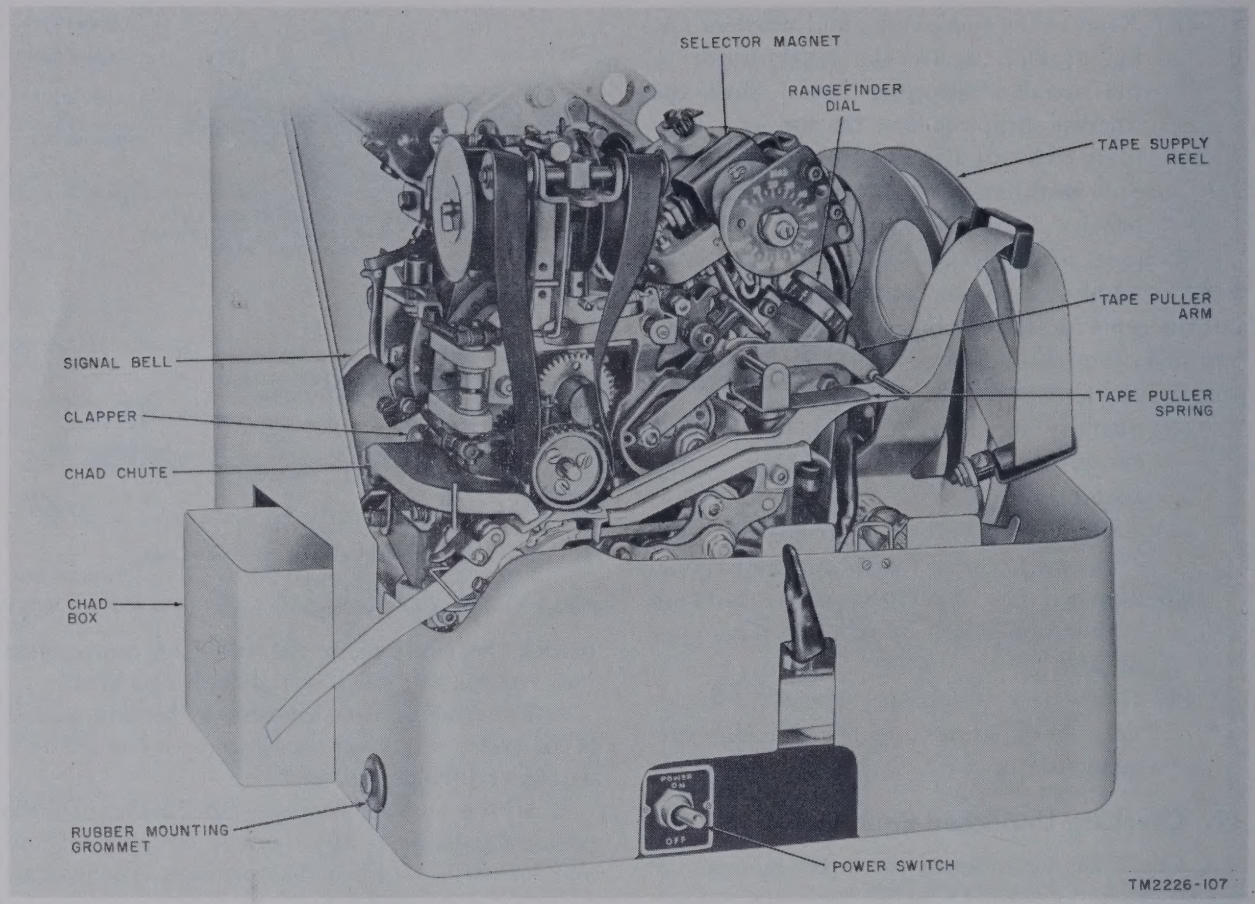


Figure 7. Teletypewriter Reperforator TT–107B/FG or TT–109/FG, cover open.

tions have not changed as the result of shipment and storage. Lubricate as directed in paragraph 39. Turn the POWER switch ON and check the air adjustment (pars. 66, 112 and 113).

15. Preliminary Adjustments

a. Checking and Adjusting Motor Speed (TT–109/FG).

(1) Turn the POWER switch (fig. 10) to ON.

(2) Strike the 180 vibrations per second (vps) tuning fork gently against the hand to set it into vibration.

(3) Look at the spots on the rotating target wheel of the series-governed motor (fig. 9) through the vibrating shutter on the end of the tuning fork; if the spots are stationary, no adjustment is necessary. If the spots are moving clockwise, pull the end of the adjusting worm outward, and hold it until the clockwise motion of the target spots has stopped. If the spots are moving counterclockwise, push the end of the adjusting worm inward until the motion of the target spots has stopped. The motor now is set at its operating speed of 3,600 revolutions per minute (rpm).

(4) Turn the POWER switch to OFF.

b. Changing the Operating Speed of the Reperforator. The operating speed of the reperforator is varied by changing the drive gearset which consists of the worm gear on the motor armature shaft and the meshing driven gear. The equipment was shipped from the factory with a 368.1 operations per minute (opm) 60 words per minute (wpm) gearset (fig. 8) installed. A gearset for 600 opm (100 wpm) operation is mounted at the left rear of the base frame. The gears are identified by the marks stamped into the gears. If necessary, change the gearset so that the operating

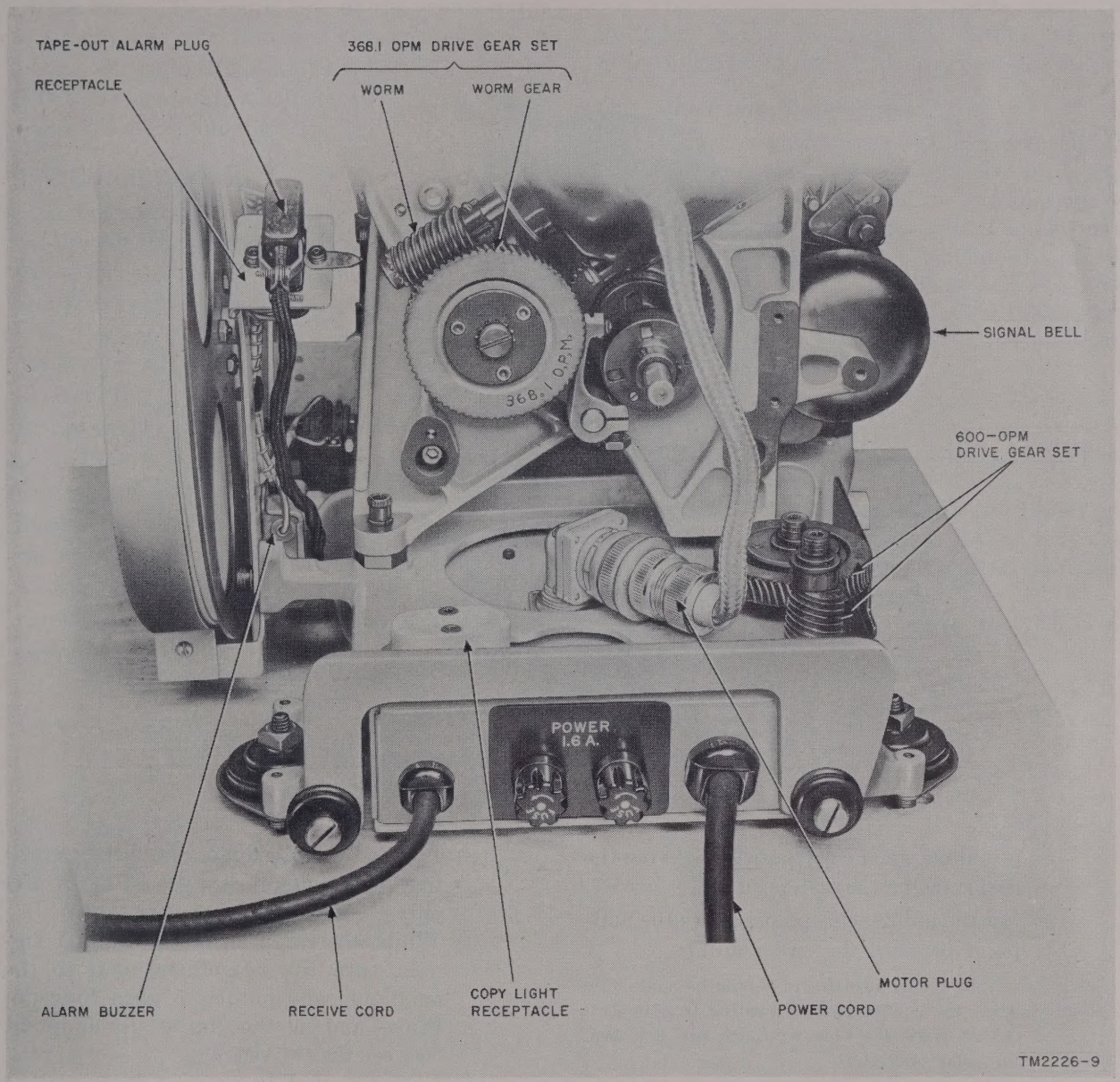


Figure 8. Rear view of the TT–107/FG, cover removed.

speed of the reperforator conforms to the operating speed of allied equipment as follows:

Note. If operation at either 404 opm (66 wpm) or 460 opm (75 wpm) is desired, it is necessary to obtain the proper gearsets through the usual supply channels.

(1) Remove the dust cover (par. 12*c*).

(2) Change the motor drive gearset (par. 168).

(3) Replace the dust cover (par. 12*e*).

c. Bias Potentiometer. The bias potentiometer on the TT–107B/FG and TT–109/FG has been adjusted and locked at the factory and requires no subsequent adjustment except after a complete overhaul. If the machine does not give the desired range, the potentiometer setting should be checked. Refer to field maintenance personnel for final testing and adjustment of the reperforator. Set the bias and line switches (par. 17) and adjust the bias potentiometer on the TT–107/FG as follows:

(1) While receiving continuous R and Y signals, set the rangefinder dial to 60 and slowly turn the knob of the BIAS potentiometer (fig. 10) to maximum and

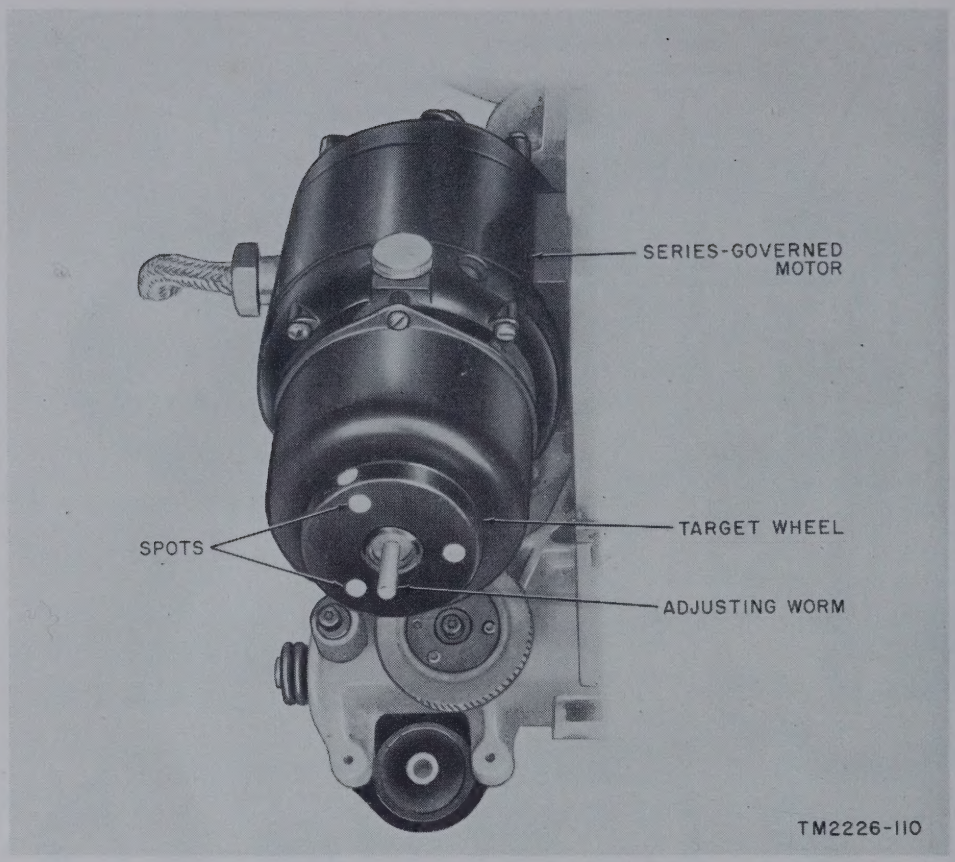


Figure 9. Series-governed motor (TT–109/FG).

minimum good copy positions. Note the dial markings at each position.

(2) Set the pointer five points above the midpoint between the two readings.

Note. This adjustment should be made only when the equipment is operating in a neutral circuit since the bias windings are not used for polar operation.

d. Adjusting Rangefinder.

Note. The rangefinder dial (fig. 7) should be moved only when signals are being received in the selector magnet and the selector camshaft is rotating.

(1) Adjust the rangefinder immediately after adjusting the bias potentiometer.

(2) Loosen the rangefinder dial lock by turning it counterclockwise (TT–107/FG only).

(3) While receiving continuous R and Y signals, turn the rangefinder dial to the maximum and minimum good copy positions and set the dial at the midpoint between the two settings.

(4) Lock the dial in position by means of the dial lock (TT–107/FG only).

e. Operational Checks.

(1) Perform the operational checks listed in paragraph 23.

(2) Turn the POWER switch to the OFF position.

Section III. SIGNAL CIRCUIT CONNECTIONS

16. General

a. Teletypewriter Reperforator TT–107(*)/FG or TT–109/FG is not equipped to supply current for the signal line circuits. Current for these circuits must be supplied by a telegraph switchboard, a line unit, Telegraph Terminal TH–5/TG or some other external source.

b. The circuits within the reperforator are adapted for a particular type of operation by switches (fig. 10) on the base frame at the front

of the unit. The signal line of the reperforator is terminated in a standard two-conductor jack plug. Operationally the TT–107B/FG and the TT–109/FG are identical, the only difference being in the motor and filter.

17. Circuit Options

a. Neutral Operation (TT107/FG). Place the bias switch (fig. 10) in the NEUTRAL position. Place the line switch in whichever position corresponds to the current value of the signal line.

b. Neutral Operation (TT–107B/FG and TT–109/FG). Set the bias switch and the line switch to either the 20 MA or 60 MA position, whichever is applicable.

c. Polar Operation (TT–107/FG). Place the bias switch in the POLAR position. Place the line switch in whichever position corresponds to the current value of the signal line. The 20 MA position is used when operating on 15 ma polar signals and the 60 MA position is used when operating on 30 ma polar signals.

d. Polar Operation (TT–107B/FG and TT–109/FG). Set the bias switch to the POLAR position and the line switch as described in *c* above.

18. Signal Line Connection

Connect the reperforator into the external signal line by placing the plug of the receive cord (fig. 8) into the appropriate jack of the terminal equipment connected to the desired line. The line may be terminated in a line unit, a switchboard, a jack box, Telegraph Terminal TH–5/TG, or some similar line terminating device. After the connection has been made, line up the equipment as described in paragraph 19.

19. Circuit Lineup

a. Connect the reperforator as described in paragraph 18.

b. Turn the POWER switch to the ON position.

c. Arrange to have the distant station send test signals. Adjust the bias potentiometer (par. 15*c*) and the rangefinder (par. 15*d*).

d. Turn the POWER switch to the OFF position.

CHAPTER 3

OPERATION

20. Reperforator Controls

(fig. 10.)

The following chart lists the various controls and switches used in the operation of Teletypewriter Reperforator TT–107(*)/FG and TT–109/FG. The operation of the TT–107B/FG and TT–109/FG are identical. The operator must become familiar with the location and function of each control before attempting to operate the equipment.

Control	Location	Function
POWER switch.	At left front of base.	ON position connects ac input to equipment. OFF position disconnects ac input to equipment.
Manual tape feed-out lever.	Center front above base frame.	When moved counterclockwise causes reperforator to feed out blank message tape.

21. Warning Devices

The following devices are used to alert the operator to certain operating conditions.

Control	Location	Function
Tape-alarm buzzer (fig. 8).	Behind the tape reel.	Audibly indicates diminishing supply of tape.
Signal bell (fig. 7).	Mounted on the reperforator frame.	Signals the operator. Bell will ring when the machine is in the figures position and the S code group is received.

22. Preparation for Starting

a. Power Connection. Be sure that the power cord is properly grounded and insert the power cord in the power outlet.

b. Tape Supply. Check for sufficient paper tape. If it is low, open the dust cover door and install new paper tape as follows:

(1) *TT–109/FG* (fig. 11).

(*a*) Push the reel support latch and raise the outer reel support arm.

(*b*) Move the tape-out sensing lever (fig. 10) away from the reel hub; place the roll of paper tape on the hub so that the tape feeds from the rear to the front over the top of the paper tape roll. Release the tape-out sensing lever so that the upper end is against the roll of paper tape.

(*c*) Swing the outer reel support arm down to the latched position, and thread the end of the paper tape around the guide rollers (fig. 11).

(*d*) Feed the paper tape into the tape chute; pass it under the type wheel and into the slot in the punch and die assembly.

(*e*) Press down on the tape retainer lever and feed the paper tape under the roller. Feed out enough paper tape so that it will extend through the opening in the dust cover when the dust cover is closed. Close the dust cover door.

(2) *TT–107B/FG and TT–109/FG* (fig. 12).

(*a*) Lift straight up on the tape reel assembly to remove it from the reperforator.

(*b*) Shut off the tape alarm buzzer by moving the tape alarm lever downward

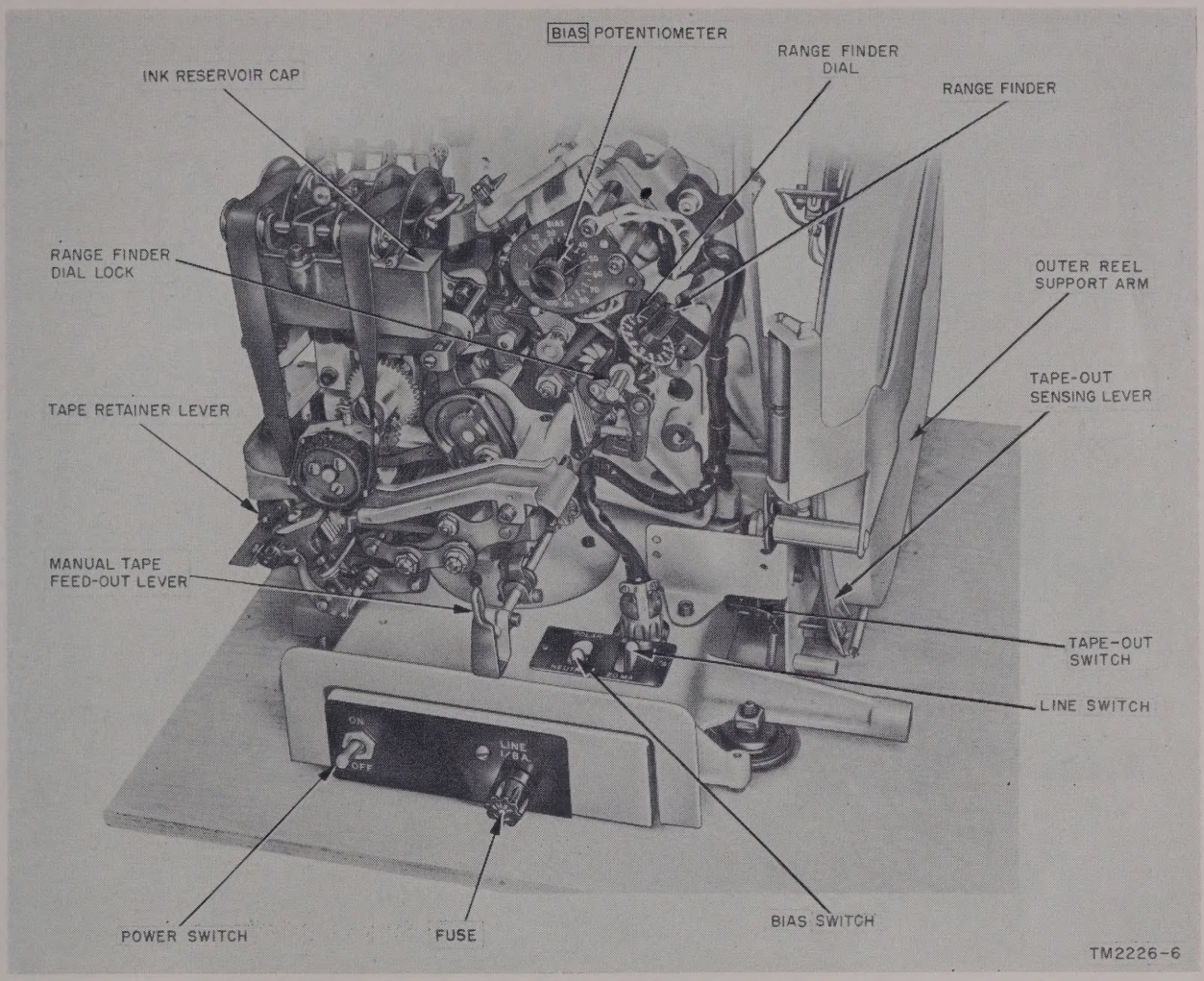


Figure 10. Reperforator controls.

until it is locked in place by the tape alarm lever latch.

(*c*) Press the release plunger and turn the tape roll retaining plate counterclockwise to release the tape roll retaining plate from the reel hub; remove the tape roll retaining plate and the core from the old paper tape roll.

(*d*) Position the new paper tape roll on the reel hub so that the paper tape feeds from the rear to the front over the top of the paper tape roll. Position the tape roll retaining plate on the reel hub. Apply slight pressure on the tape roll retaining plate and turn it clockwise until it engages the projections on the reel hub and the release plunger engages the hole in the tape roll retaining plate.

(*e*) Position the assembled tape reel assembly and the paper tape roll on the reperforator. Press the tape alarm lever latch to permit the tape alarm lever to pivot against the paper tape roll.

(*f*) Thread the end of the paper tape through the tape guide.

(*g*) Thread the paper tape through the tape puller so that the paper tape is under the stud at the end of the tape puller arm and is between the tape puller stud and the tape puller spring.

(*h*) Feed the paper tape into the tape chute; pass it under the type wheel and

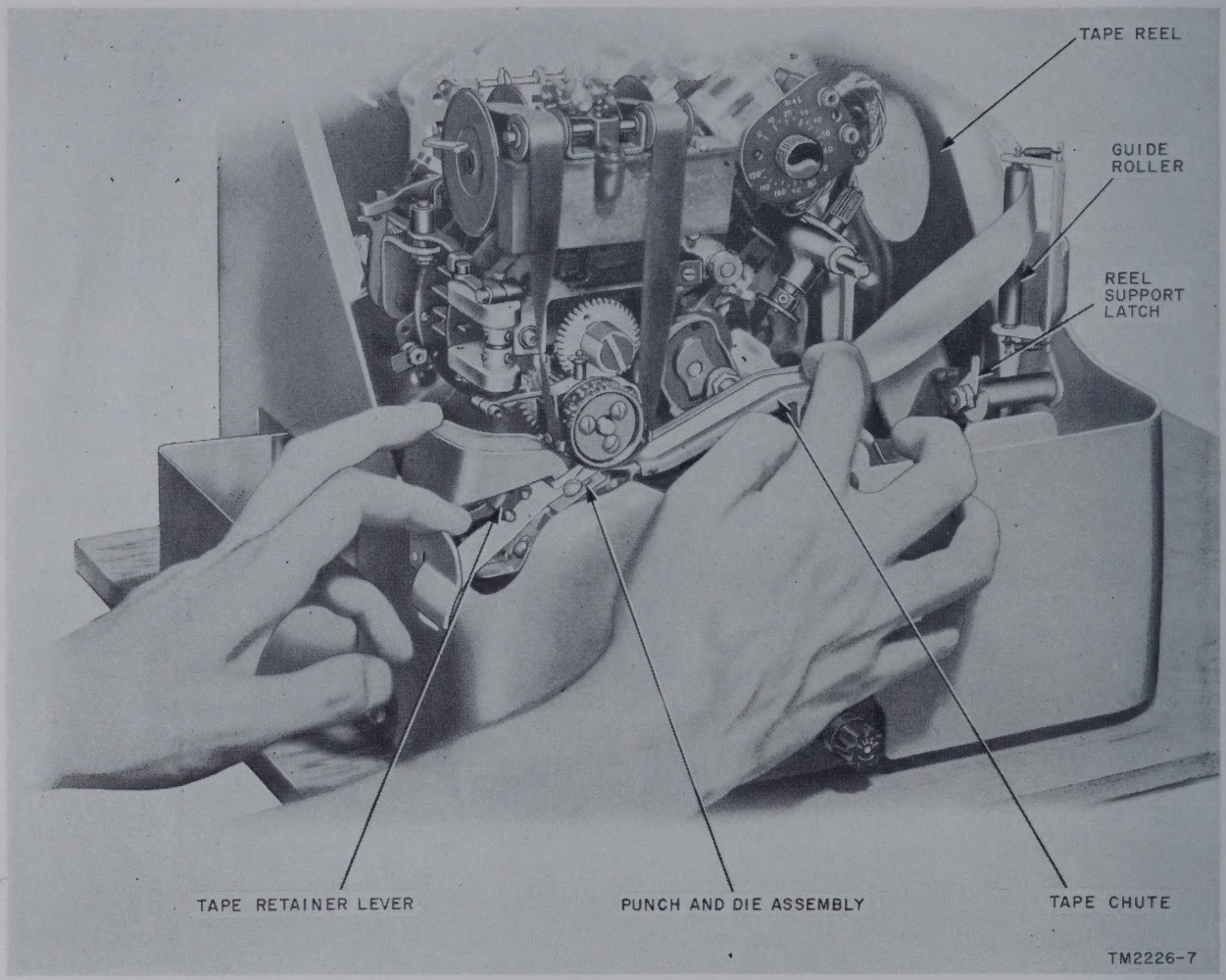


Figure 11. Tape installation details (TT–107/FG).

into the slot in the punch and die assembly.

(*i*) Press down on the tape retainer lever and feed the paper tape under the roller. Feed enough tape through so that paper tape will extend through the opening in the dust cover when the dust cover is closed. Close the dust cover door.

c. Inking Ribbon. Check the inking ribbon. If it is torn or badly frayed, wind the ribbon completely on one spool and replace it as follows:

(1) *TT–107/FG* (fig. 13).

(*a*) Raise the spool clip, push backward on the ribbon sensing lever, pull forward on the tab at the top of the ribbon retainer, and place the loaded ribbon spool on the spool shaft. Be sure that the slots in the spool hub engage the projections on the ribbon spool shaft.

(*b*) Attach the free end of the inking ribbon to an empty ribbon spool and place it on the other end of the ribbon spool shaft as indicated in (*a*) above. Leave a long loop (approximately 10 inches) in the inking ribbon.

(*c*) Move the spool clip down to its locked position.

(*d*) Pass the inking ribbon over the ribbon rollers in front of each spool.

(*e*) Give the inking ribbon a half twist, pass it under the type wheel, then slip it into the slots at each side of the ribbon guide on the type wheel.

(*f*) Open the ink reservior cap and replenish the ink supply if necessary.

(2) *TT–107B/FG and TT–109/FG* (fig. 14).

(*a*) Turn the ribbon spool locks on the spool shaft to the outward (unlocked) position. Pull forward on the tab at the top of the ribbon retainer, and place the loaded ribbon spool on the spool shaft. Be sure the slots in the spool hub engage the projections on the ribbon spool shaft.

(*b*) Attach the free end of the inking ribbon to an empty ribbon spool and place it on the other end of the ribbon spool shaft as indicated in (*a*) above. Leave a long loop (approximately 10 inches) in the inking ribbon.

(*c*) Turn the two ribbon spool locks to the inward (locked) position.

(*d*) Pass the inking ribbon over the ribbon rollers in front of each spool.

(*e*) Give the inking ribbon a half twist, pass it under the type wheel, then slip it into the slots on each side of the ribbon guide on the type wheel.

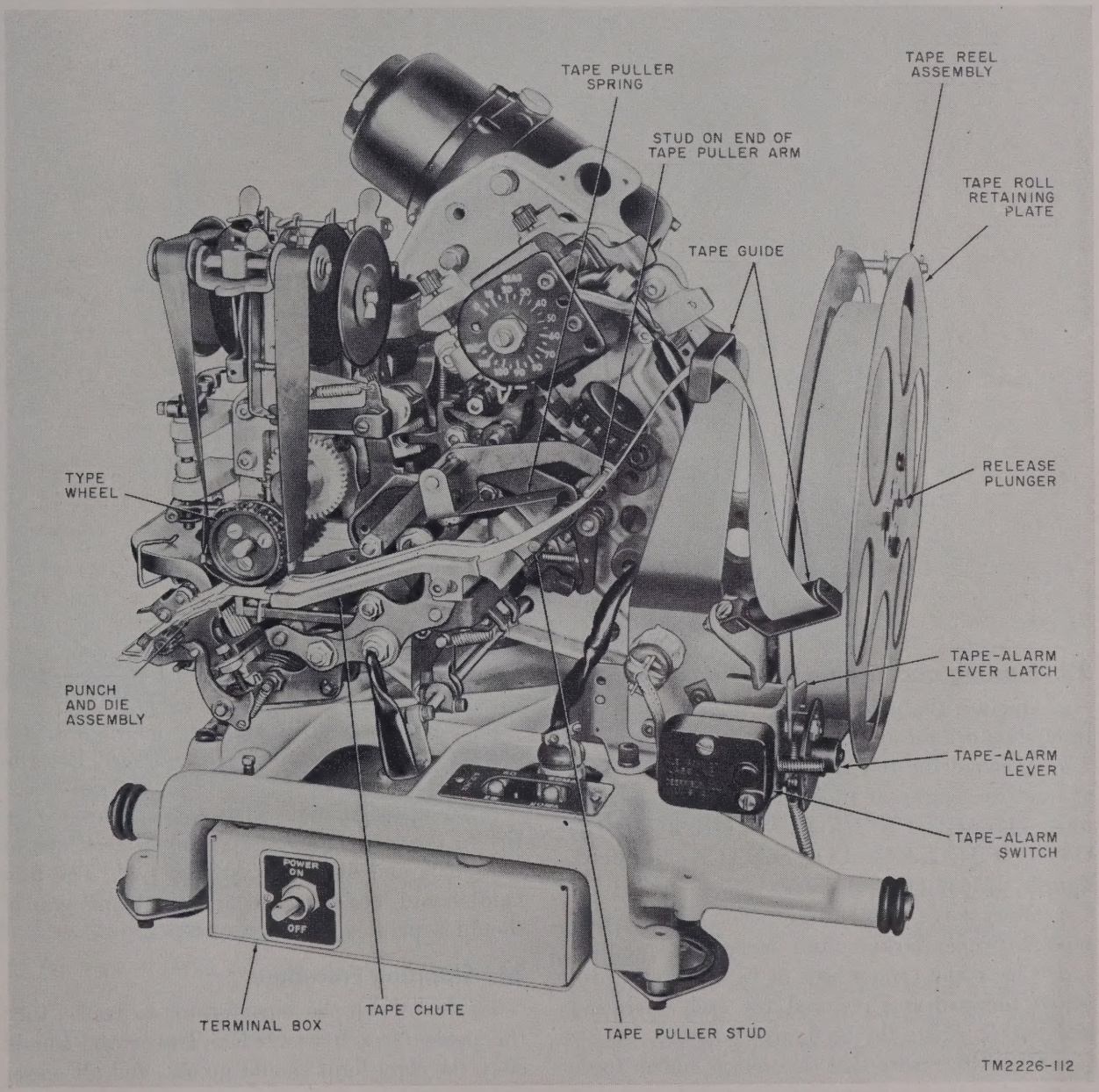


Figure 12. Tape installation details (TT–107B/FG or TT–109/FG).

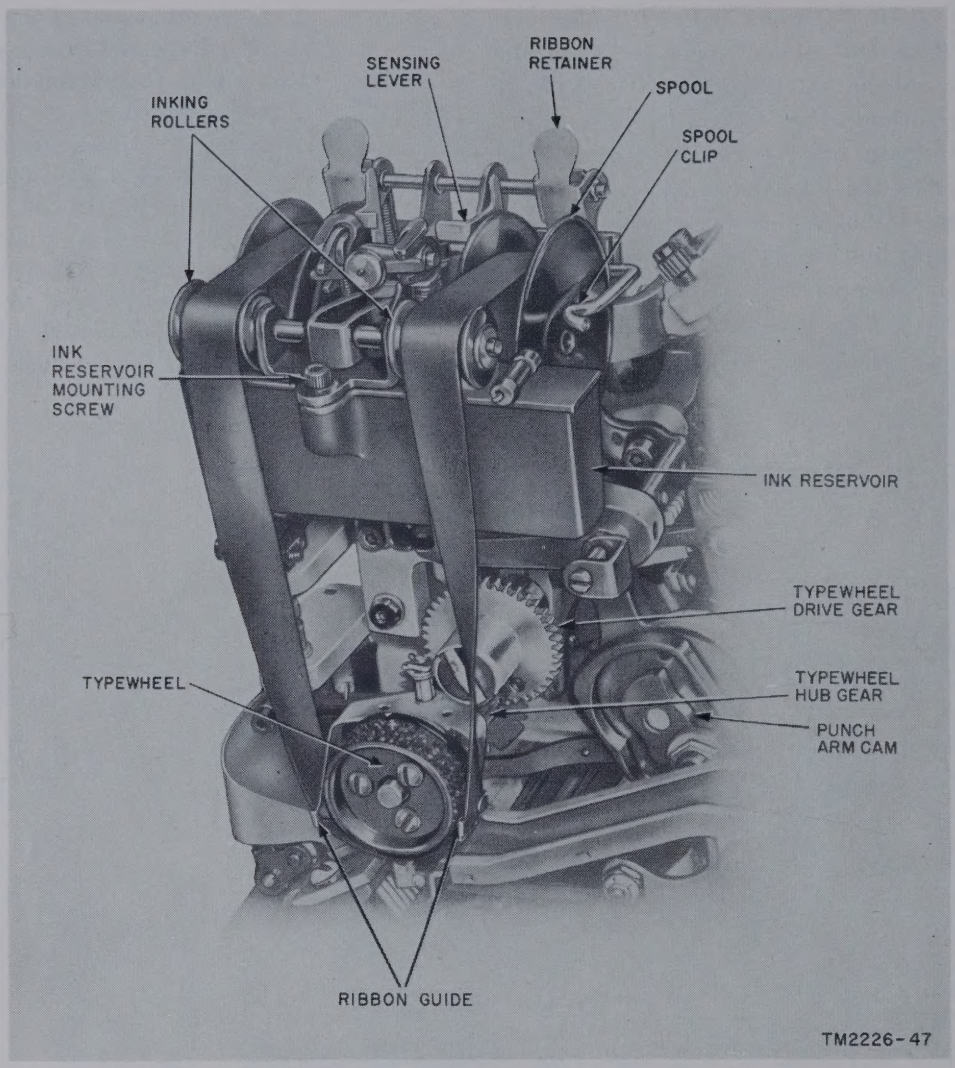


Figure 13. Ribbon feed mechanism (TT–107/FG).

23. Starting and Testing Procedures

a. Operate the power switch to ON; the copy light should light and the motor should start.

b. Arrange for the distant station to transmit at least five copies of the following message: letters, THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK, line feed, figures, 1234567890 - $! & ' () " / : ; ? , .

c. Observe the printed impression on the paper tape for proper darkness and clarity.

d. Check the type wheel to be sure it is projected forward and restored for each operation and that it shifts to the figures position.

e. Check to insure that the inking ribbon feeds every other time a character is printed, and that it projects forward and backward with the type wheel each time a character is printed.

f. Check the punch and die mechanism for proper punching of the code and feed holes in the paper tape.

g. Move the manual tape feed-out lever (fig. 10) to the left. Paper tape should feed out of the punch and die assembly (fig. 12). The feed hold should be perforated and the blank symbol should be printed on the paper tape.

24. Stopping Procedure

To shut down the reperforator to traffic, turn the power switch to OFF. The motor should stop, the copy light should go out, and all power is removed from the unit.

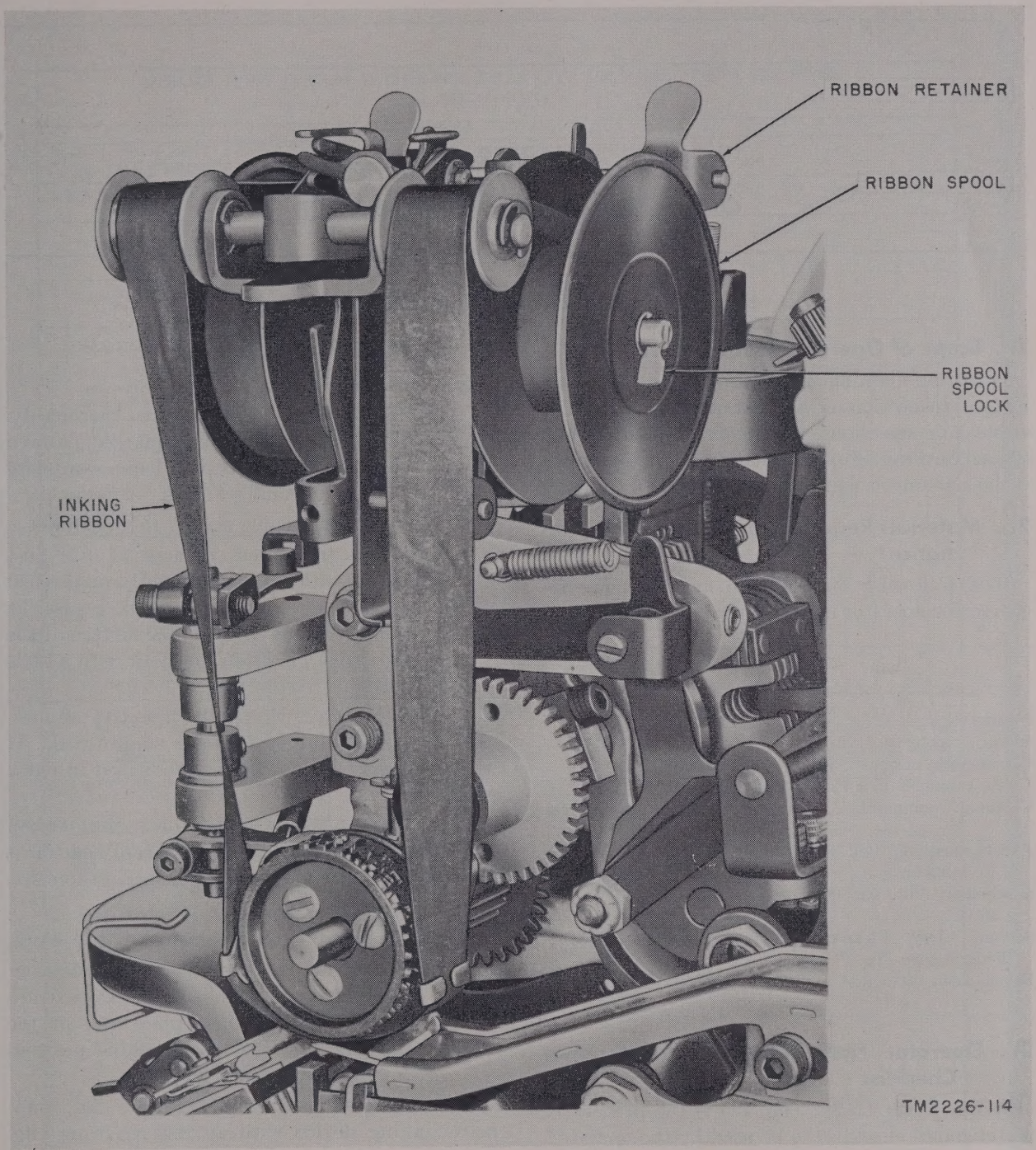


Figure 14. Inking ribbon installation (TT–107B/FG and TT–109 FG).

25. Emergency Procedure

If the reperforator becomes disabled, proceed as follows:

a. Notify the maintenance unit at the station. Describe as fully as possible the nature of equipment malfunction.

b. Notify the other stations in the circuit of the trouble and estimate, if possible, the length of time required before operation can be resumed.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

Section I. FIRST ECHELON MAINTENANCE

26. Scope of Operator Maintenance

Operator maintenance is limited to the cleaning and inspection of external parts, inspection of electrical connections, wiring, and insulation, and the performing of operational checks to determine if the machine is operating properly.

27. Materials Required for Operator Maintenance

The following maintenance materials are required for operator maintenance:

Item	Signal Corps stock No.
Orange stick	6Z7360
Brush, toothbrush style	53–B121610(QM)
Cheesecloth, bleached, 36 in. wide	6Z1989
Cloth, crocus, 9-in. x 11-in. sheets	6Z2000
Cleaning Compound	Federal stock No. 7930–395–9542.
Paper, cleaning, Bell Seal bond ¼ in. x 2½ in.	6M750
Sandpaper, flint, No. 0000, 9 in. x 10 in.	6Z7500–0000
Solvent, Dry Cleaning (SD), (Federal spec. No. P–S–661a).	51–S–4385–1 (QM)
Brush, sash, 1 x ⅝ in	6Z1567

28. Operator First Echelon Maintenance Checklist

a. DA Form 11–252 (fig. 15) is the preventive maintenance checklist to be used by the operator.

b. Items not applicable to Teletypewriter Reperforator TT–107 (*)/FG or TT–109/FG are lined out in figure 15. References to the ITEM block in this figure are to paragraphs in this manual that contain additional maintenance information pertinent to the particular item.

29. Operator's Maintenance

a. Covers.

(1) Inspect the dust covers thoroughly. Look for dents, cracks, marred painted surfaces, rust, corrosion, loose or missing screws, and faulty hinges.

(2) Check all visible screws for tightness.

(3) Clean the outer surfaces of the dust cover with a cloth slightly moistened with water. To remove oil, grease, or gummy stains on the outer surface of the dust cover, moisten the cloth with a little solvent (SD).

b. Tape Supply. Check the quantity of message tape remaining in the tape supply reel. If necessary, install a new roll as described in paragraph 22*b*.

c. Inking Ribbon. Inspect the inking ribbon for signs of excessive wear. If replacement is necessary, replace as described in paragraph 22*c*.

d. External Wiring.

(1) Wipe the external wiring with a cloth.

(2) Check the wiring for cracks, deteriorated insulation, kinks, or excessive strain due to the improper placement of the machine. Adjust the machine position to relieve the strain.

e. Ink Reservoir (TT–107/FG). An automatic inking device with an ink reservoir (fig. 10) is provided on the TT–107/FG. The ink level in the reservoir should be checked frequently and replenished as needed. To fill the reservoir, lift the ink reservoir cap (fig. 10) and add ink until the level is approximately one-fourth inch below the lip of the reservoir.

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
TELETYPEWRITER

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.
TELETYPEWRITER REPERFORATOR TT-107/FG	37

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	INSPECT UNIT FOR PRESENCE OF ~~TOOLS,~~ ACCESSORIES, AND RUNNING SPARES. PAR. 7	✓	✓					
2	~~TIGHTEN ALL LOOSE SCREWS, BOLTS, AND NUTS ON CHESTS, TELETYPEWRITER COVER, COMPONENT PANEL.~~							
3	CLEAN INSIDE AND OUTSIDE OF ~~CHESTS AND~~ TELETYPEWRITER COVER OF DIRT, GRIME, GREASE, RUST, OIL, GUMMY DEPOSIT. PAR. 29a	✓	✓					
4	INSPECT THE COVER OF THE TELETYPEWRITER FOR ~~CRACKED OR BROKEN GLASS,~~ LOOSE SCREWS, BROKEN OR DAMAGED HINGES, DAMAGED COPYHOLDER, SCRATCHES.	✓	✓					
5	INSPECT ALL ELECTRICAL CONNECTIONS FOR FIRMNESS OF SEATING AND PROPER CONTACT, CORROSION, GREASE, OIL.	✓	✓					
6	~~TIGHTEN ALL LOOSE ELECTRICAL CONNECTIONS.~~							
7	~~TIGHTEN ALL LOOSE SCREWS, LUGS, MOUNTING BOLTS ON TERMINAL BLOCKS, AND SLIP CONNECTORS.~~							
8	CLEAN EXTERIOR OF ~~KEYS,~~ SWITCHES, ~~AND TERMINAL BLOCKS~~ OF DIRT, GREASE, GRIME, MOISTURE.	✓	✓					
9	INSPECT EACH ~~KEY OR~~ SWITCH FOR PROPER MECHANICAL ACTION; FREEDOM OF MOVEMENT, POSITIVE ACTION, SPRING TENSION; ~~LOOK FOR BROKEN, MISSING OR ILLEGIBLE KEY TOPS.~~	✓	✓					

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
10	INSPECT ~~CHESTS~~ FOR ~~DIRT, CRACKS, MISSING OR BROKEN SCREWS,~~ RUST, DAMAGE, WORN LORD MOUNTINGS.		12	~~INSPECT TERMINAL BLOCKS FOR CRACKS, BREAKS, DIRT, LOOSE CONNECTIONS, LOOSE SCREWS AND MOUNTINGS.~~	
11	INSPECT ~~ALL~~ WIRING AND CABLING FOR CRACKS, ROTTING INSULATION, FRAYED, CUT, OR GOUGED JACKETING, KINKS, PROPER SUPPORT WHERE REQUIRED, LOOSE TERMINATIONS, BROKEN CONDUCTORS.		13	OPERATE THE TELETYPEWRITER AND CHECK FOR SMOOTH OPERATION, CLEAR PRINTING, SIGNS OF WEAR, ~~EVIDENCE OF MOTOR OVERHEATING.~~	

14 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA FORM 1 MAY 51 **11-252** REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM2226-116

Figure 15. DA Form 11–252.

Section II. SECOND ECHELON MAINTENANCE

30. Scope of Technician's Maintenance

This level of maintenance must be performed by qualified technicians and includes all items of maintenance which can be done with the tools available to the maintenance technician provided that part replacement, other than the replacement of running spares, is not required. Partial disassembly required to perform any of the items of maintenance described in this section are within the scope of the second echelon maintenance technician.

31. Tools and Maintenance Materials Required

a. Tools. No tools are supplied with Teletypewriter Reperforator TT–107(*)/FG or TT–109/FG. Tool Equipment TE–50–B, is required for maintenance of the equipment. Tool Equipments TE–50 and TE–50–A do not include some special wrenches and gages included in TE–50–B. Organizations that have the TE–50 or TE–50–A should requisition the additional tools in accordance with appropriate supply bulletins.

b. Maintenance Materials.

(1) Materials necessary for maintenance at organizational levels are included in Tool Equipment TE–50–B with the exception of a liquid cleaning agent and an antiseize compound. Mechanical assemblies should be cleaned with solvent (SD). Gasoline should never be used as a cleaning fluid. When solvent (SD) is not immediately available, Oil, Fuel, Diesel (DA), QMC stock No. 7–0–142 (gallon container), may be used as a temporary substitute. Cleaning Compound (Sig C stock No. 7930–395–9542) should be used only for cleaning electrical contact surfaces.

Caution: Repeated or prolonged breathing of Cleaning Compound is dangerous. Make sure adequate ventilation is provided. Cleaning Compound is flammable; do not use near a flame.

(2) These reperforators contain aluminum and magnesium castings. When steel screws are placed in such castings, tendency exists for seizure between the screws and the castings unless the screws are treated first with an antiseize compound. Screws are given such a coating at the factory when the machines are assembled. Whenever machines are disassembled, the coating should be renewed by maintenance personnel to insure that there will be no difficulty at the time of the next disassembly.

32. General Preventive Maintenance Techniques

Most preventive maintenance techniques pertain to specific areas of preventive maintenance, such as lubrication; however, the following general instructions should be helpful.

a. Use No. 0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for most cleaning purposes.

(1) When necessary, use a cloth or a brush moistened with solvent (SD) to clean parts (except electrical contacts). Wipe the solvent and dirt from the part with a clean dry cloth.

(2) A flushing action is best when cleaning electrical contacts. Dip an orange stick in cleaning compound and allow the liquid to drip from the stick through the contacts. Rub the contact surfaces with the wet orange stick to loosen dirt or gummy deposits. Allow the contacts to dry by evaporation and then polish with the contact burnisher.

c. If available, vacuum cleaning equipment is suitable for removal of loose dust, paper lint, and dirt from the reperforator.

33. Technician's Maintenance

This level of maintenance must be performed by qualified technicians. To service a reperforator thoroughly, take the equipment out of service and partially disassemble it as described in *a* below. Be sure to notify all other stations that the reperforator will be out of service temporarily. Refer to the Second and Third Echelon maintenance Checklist, DA Form 11–253 (fig. 16). Items not applicable to TT–107(*)/FG or TT–109/FG are lined out in the figure.

References in the ITEM blocks refer to paragraphs in the text which contain additional maintenance information.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
TELETYPEWRITER

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE: TELETYPEWRITER REPERFORATOR TT-10F/FG

EQUIPMENT SERIAL NO.: 23

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION
1	INSPECT UNIT FOR PRESENCE OF ~~TOOLS~~, ACCESSORIES, AND RUNNING SPARES. PAR. 5,7	✓
2	TIGHTEN ALL LOOSE SCREWS, BOLTS, AND NUTS ON ~~CHESTS~~, TELETYPEWRITER COVER, COMPONENT PANEL.	✓
3	CLEAN INSIDE AND OUTSIDE OF ~~CHESTS AND~~ TELETYPEWRITER COVER OF DIRT, GRIME, GREASE, RUST, OIL, GUMMY DEPOSIT. PAR. 29a	✓
4	INSPECT THE COVER OF THE TELETYPEWRITER FOR ~~CRACKED OR BROKEN GLASS~~, LOOSE SCREWS, BROKEN OR DAMAGED HINGES, ~~DAMAGED COPYHOLDER~~, SCRATCHES.	✓
5	INSPECT ALL ELECTRICAL CONNECTIONS FOR FIRMNESS OF SEATING AND PROPER CONTACT, CORROSION, GREASE, OIL. PAR. 29d	✓
6	TIGHTEN ALL LOOSE ELECTRICAL CONNECTIONS.	✓
7	TIGHTEN ALL LOOSE SCREWS, LUGS, MOUNTING BOLTS ON TERMINAL BLOCKS, ~~AND SLIP CONNECTORS.~~ PAR. 33g	✓
8	CLEAN EXTERIOR OF ~~KEYS~~, SWITCHES, AND TERMINAL BLOCKS OF DIRT, GREASE, GRIME, MOISTURE. PAR. 33d, 33f, 33g	✓
9	INSPECT EACH ~~KEY OR~~ SWITCH FOR PROPER MECHANICAL ACTION; FREEDOM OF MOVEMENT, POSITIVE ACTION, SPRING TENSION; ~~LOOK FOR BROKEN, MISSING OR ILLEGIBLE KEY TOPS.~~	✓
10	INSPECT ~~CHESTS~~ FOR ~~DIRT, CRACKS, MISSING OR BROKEN SCREWS,~~ RUST, DAMAGE, WORN LORD MOUNTINGS.	✓
11	INSPECT ALL WIRING AND CABLING FOR CRACKS, ROTTING INSULATION, FRAYED, CUT, OR GOUGED JACKETING, KINKS, PROPER SUPPORT WHERE REQUIRED, LOOSE TERMINATIONS, BROKEN CONDUCTORS. PAR. 33f	✓
12	INSPECT TERMINAL BLOCKS FOR CRACKS, BREAKS, DIRT, LOOSE CONNECTIONS, LOOSE SCREWS AND MOUNTINGS. PAR. 33g	✓
13	OPERATE THE TELETYPEWRITER AND CHECK FOR SMOOTH OPERATION, CLEAR PRINTING, SIGNS OF WEAR, EVIDENCE OF MOTOR OVERHEATING. PAR. 33c	✓
14	SOLDER ANY LOOSE OR BROKEN SOLDER CONNECTIONS.	✓
15	~~INSPECT THE CONTACTS OF SWITCHES AND KEYS FOR PITTING, CORROSION AND WEAR.~~	
16	~~ADJUST SPRING TENSION OF CONTACT SPRINGS, KEY AND SWITCH CONTACTS WHERE NECESSARY.~~	
17	~~CLEAN CONTACTS OF SWITCHES AND KEYS OF DIRT, GREASE, DUST, CORROSION.~~	
18	CLEAN THE ~~TYPING~~ UNIT ~~AND TYPE BAR CARRIAGE~~ VERY CAREFULLY OF GREASE, DUST, DIRT, OIL; *(care should be exercised to prevent dirt from getting into the bearings).*	✓
19	INSPECT THE ~~TYPING~~ UNIT FRAME CASTING, ~~TYPE BAR CARRIAGE FRAME CASTING, KEYBOARD CASTING, MOTOR BASE~~ FOR CRACKS, ~~LOOSE OR MISSING SCREWS~~, OTHER DAMAGE.	✓
20	INSPECT THE ~~TYPING~~ UNIT, ~~TYPE BAR CARRIAGE, KEYBOARD,~~ FOR LOOSE OR MISSING SCREWS, FREE MOVEMENT OF ALL MOVING PARTS, BENT, BROKEN, DISTORTED, OR WORN SHAFTS, GEARS, SPRINGS, BEARINGS, CAMS, CLUTCHES.	✓
21	ADJUST ANY ITEMS ~~ON TYPING UNIT~~ WHICH REQUIRE ADJUSTMENT. PARS. 45 THROUGH 124	✓
22	~~INSPECT EACH BELL CRANK, CODE BAR, TYPE-BAR, TO DETERMINE THAT ALL PARTS MOVE FREELY AND ARE NOT BENT OR BROKEN; THERE ARE NO MISSING OR DAMAGED PALLETS.~~	
23	~~INSPECT GEARS, SHAFTS, BEARINGS OF TYPE-BAR CARRIAGE FOR SIGNS OF EXCESSIVE WEAR, LOOSE PARTS, DAMAGE.~~	
24	~~ADJUST ANY UNITS ON THE TYPE-BAR CARRIAGE THAT REQUIRE ADJUSTMENT.~~	
25	INSPECT THE MOTOR FOR SIGNS OF OVERHEATING, WORN BRUSHES, PROPER BRUSH SPRING TENSION. PAR. 33c	✓
26	CLEAN THE MOTOR AND GOVERNOR ASSEMBLY OF DIRT, GREASE, FOREIGN MATTER. PAR. 33c	✓
27	~~CLEAN OIL, GREASE, DUST, DIRT FROM KEYBOARD, KEY TOPS, KEY LEVERS, AND AROUND THE TRANSMITTING MECHANISM.~~	
28	INSPECT THE MOISTURE AND FUNGUS PROOFING.	✓
29	INSPECT GENERAL CONDITION OF LUBRICATION AND LUBRICATE AS REQUIRED ACCORDING TO LATEST DEPARTMENT OF THE ARMY LUBRICATION ORDER. PAR. 39	✓

30 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA FORM 1 MAY 51 11-253 (*Formerly DA AGO*) REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE

TM2226-115

Figure 16. DA Form 11-253.

a. Procedure. Remove the equipment from service and perform the following:

(1) Remove the power cord from the wall outlet.

(2) Remove the signal line cord from the line terminating devices.

(3) Remove the dust cover (par. 12).

(4) Remove the reperforator mechanisms from the base frame (par. 165*b*).

b. Preventive Maintenance for Base Frame.

(1) Clean the base thoroughly. Wipe away all deposits of oil or grease that may have dropped from the mechanical assemblies. Brush away all loose dirt and paper lint from the hard-to-get-at places such as connecting jacks, switches, and terminal boards. If grimy deposits are difficult to remove with a dry cloth, moisten the cloth with solvent (SD).

(2) Perform preventive maintenance on cords, cables, wiring, terminal boards, keys and switches as described in *f*, *g*, and *h* below.

c. Preventive Maintenance for Motor.

(1) The motor should turn freely and quietly with very little end play when turned by hand. Check the motor for evidences of overheating. This may be indicated by discoloration or by an odor of burned insulating material. Check the governor, governor cover, and target of the governed motor for looseness (TT–109/FG). To correct any looseness, tighten the mounting screws firmly.

(2) Clean the exterior of the motor. Remove all dust, dirt, grease, and corrosion from the outside of the motor. Check to see that the governor (TT–109/FG) is clean and that the wires leading to the motor are intact.

(3) Apply lubricant, as necessary, to the governor lubrication points of (TT–109/FG) listed in paragraph 39*e*.

d. Preventive Maintenance for Terminal Box.

Warning: The failure of selenium rectifiers can result in the liberation of poisonous fumes and deposit of poisonous selenium compounds. If a rectifier burns out or arcs over, the odor is strong. Provide adequate ventilation immediately. *Avoid inhaling the fumes and do not handle the damaged rectifier until it has cooled.*

(1) Remove the six screws which secure the terminal box cover; remove the cover. Inspect for loose connections, damaged or broken parts, and defective or burned-out wiring. Look for evidence of overheating, and note whether the transformer and rectifying stack appear to be discolored. Check the fuse holder and the switches.

(2) Tighten all loose screws, bolts, nuts and cable clamps. Solder any loose or broken connections.

(3) Use a suitable brush, cheesecloth, and a vacuum cleaner, if available, to remove dust and dirt. To remove oily or gummy deposits, use a cloth dampened with a small quantity of solvent (SD). Remove all rust spots and paint all exposed metal surfaces.

e. Preventive Maintenance for Reperforator.

(1) Examine all operating mechanical assemblies for signs of wear, lack of lubrication, accumulations of dirt or grime, and undesired looseness of any operating parts.

(2) Check the condition of the inking ribbon. Replace it if necessary (par. 22*c*). If the top edge of the inking ribbon appears frayed and the rest of the inking ribbon is serviceable, check the ribbon guides for proper alinement.

(3) Check the type wheel (fig. 13) for dirt deposits in the character symbols. Clean the type wheel with a brush moistened with solvent (SD). Check the small center areas of letters such as O, Q, D, G, and B to be sure no dirt remains.

(4) After performing all maintenance checks, lubricate the assemblies as described in paragraph 39. Remove all excess lubricant.

f. Preventive Maintenance for Cords, Cables, and Wiring.

(1) Check all visible wiring for cracked or deteriorated insulation, frayed or cut insulation at connecting points, kinks, and strain caused by improper placement.

(2) Tighten loose fasteners, clamps, and wiring connections. Repair loose or broken connections. Remove corrosion, rust, dirt, and dust from ground connections. Be sure that the outer insulating cover on cords and cables is wiped clean. Never use oil or solvent (SD) on rubber insulation.

(3) Adjust the wiring so that it does not interfere with the operation of mechanical parts. It may be necessary to resolder certain connections or to replace some wiring or conductors when they become worn or damaged.

g. Preventive Maintenance for Terminal Boards.

(1) Terminal boards used as distributing points for electrical circuits usually are made of a strip of insulating material and one or more types of electrical connectors. These devices may be either solder- or screw-type terminals, contact springs, or contact lugs. They normally require little preventive maintenance unless the wiring is changed. Inspect the terminal boards for cracks, breakage, and loose connecting or mounting screws. Examine the connections for mechanical defects (broken or stripped screws and threads), dirt, grease, and corrosion. Tighten loose screws, lugs, and mounting bolts. Use tools of the correct size. Be extremely careful not to strip the threads by exerting too much force. Solder loose or broken connections.

(2) Wipe off any moisture with a clean cloth and brush the dust and dirt from the terminal board with a clean dry brush. When necessary, terminal boards may be cleaned with a cloth moistened with solvent (SD); be careful that the solvent (SD) does not come in contact with the insulation of any of the wires leading to the terminal board. Remove and clean corroded or loose connections. Use Cleaning Compound to clean electrical contacts on all connecting devices.

h. Preventive Maintenance for Switches.

(1) Inspect the mechanical action of each switch. Look for dirt or corrosion. Operate each switch to see that it moves freely and snaps into position. Tighten loose mounting parts. Remove loose connections that are dirty or corroded, and clean them before they are tightened or soldered. Tighten switch connections and repair soldered connections.

(2) Wipe off any moisture present. Carefully clean the exterior surfaces of switches with a dry, stiff brush. Make sure the operating lever of the tape-alarm switch moves freely and actuates the switch.

i. Reassembly and Performance Test.

(1) Replace the reperforator mechanisms on the base frame by reversing the disassembly sequence described in paragraph 165*b*.

(2) Replace the dust cover (par. 12*e*).

(3) Connect the power cord into the outlet from which it was removed.

(4) Insert the signal line cord into the appropriate line terminating device.

(5) Test the operation of the reperforator as described in paragraph 23.

Section III. LUBRICATION

34. General

Lubrication is the most important single item in a preventive maintenance program. Carefully follow the lubrication instructions given in paragraphs 35 through 39. The lubrication instructions for the TT–107/FG, the TT–107B/FG, and the TT–109/FG are identical, except where indicated.

35. Recommended Lubricants

The following lubricants are recommended for use with Teletypewriter Reperforator TT–107(*)/FG and TT–109/FG.

a. Oil, lubricating, Signal Corps stock No. 6G1325 (1 quart can).

b. Grease, Signal Corps stock No. 6G650 (1 pound container).

36. Recommended Lubrication Schedule

The following chart shows the recommended intervals for checking the lubrication of reperforators. When checking, lubricate only those points that require lubrication. DO NOT OVERLUBRICATE.

Reperforator operating speeds (wpm)	Operating periods (number of days)			
	Up to 8 hours per day	8 to 12 hours per day	12 to 16 hours per day	16 to 24 hours per day
60	30	20	15	10
66	27	18	13	9
75	24	18	12	8
100	18	12	9	6

37. Preparation for Lubrication

To completely lubricate the reperforator, take it out of service and disassemble it as outlined in *a* below. After lubrication, reassemble the reperforator and make the checks and adjustments listed in paragraph 15.

a. Disassembly. To disassemble the reperforator for lubrication, proceed as follows:

(1) Remove the power cord from the wall outlet and remove the dust cover (par. 12*c*).

(2) Remove both ribbon spools and the inking ribbon on the TT–107/FG as follows:

(*a*) Raise the spool clip (fig. 13).

(*b*) Push backward on the ribbon sensing lever.

(*c*) Pull forward on the tab at the top of the ribbon retainer.

(*d*) Remove the ribbon spools and the ribbon.

(3) Remove both ribbon spools and the inking ribbon on the TT–107B/FG and TT–109/FG as follows:

(*a*) Move the ribbon spool locks (fig. 14) at the ends of the ribbon spool shaft to the outward (unlocked) position.

(*b*) Pull forward on the tab at the top of the ribbon retainer.

(*c*) Remove the ribbon spools and inking ribbon from the ribbon spool shaft.

(4) Tear the paper tape where it enters the tape chute (fig. 12). Depress the tape retainer lever and remove the paper tape from the punch and die assembly.

(5) On the TT–109/FG remove the motor governer target and cover (par. 171*a*(6) and (7)).

b. Old Lubricants. Remove all old grease and oil with a clean, dry, lint-free cloth. Wrap the cloth around the end of a screwdriver or an orange stick to remove old lubricants from hard-to-reach places.

38. General Lubrication Instructions

a. Method of Applying Grease. Use a grease gun to apply grease to gears. Hold the nozzle of the grease gun against the gear teeth at an angle of about 45°. Operate the handle until enough grease is ejected and, at the same time, turn the gear to form a continuous ribbon of grease.

b. Method of Applying Oil. To apply only one or two drops of oil, dip a piece of No. 22 wire approximately one-half inch into the oil and immediately touch it to the lubrication point to be oiled. This method prevents overlubrication. Where more oil is required, use the oiler supplied with Tool Equipment TE–50–B.

c. Preventing Corrosion. Apply only enough oil (except as otherwise indicated) to wet the rubbing surfaces. After the reperforator is completely lubricated, wipe off excess oil and any visible dirt.

39. Detailed Lubrication Instructions

(figs. 17–23)

The points to be lubricated, the type of lubricant to be used, and the quantity applied are listed in the charts below. The item numbers are arranged according to the method of application, so that the reperforator can be treated by one lubricant or by one method at a time in a systematic way. Item numbers shown in figures 17 through 23 for the parts to be lubricated correspond with item numbers listed in the charts.

a. Ball Bearings. All ball bearings in the reperforator are sealed and do not require lubrication.

b. Gears. Wipe old grease from the gears with a clean, dry, lint-free cloth and apply fresh grease as follows:

Fig. No.	Item No.	Name of part	Method and quantity
17	19	Type wheel driven gear.	*Do not lubricate this gear.*
18	12	Type wheel hub assembly.	Apply grease sparingly only around those teeth engaged by the register lever.
19	17	Stop arm shaft driven gear.	Apply grease sparingly around gear teeth.
	21	Function shaft driven gear.	Apply grease sparingly around gear teeth.
20	12	Function shaft drive gear.	Work grease around gears, cover teeth liberally.
21	3	Function shaft drive gear.	Apply grease sparingly around gear teeth.
	4	Drive gearset_____	Work grease around gears, cover gear teeth liberally.

c. Cams. Use a cloth moistened with solvent (SD) to remove all of the old lubricants and any dust or residue that might be present. Dry the surface thoroughly, and apply grease as indicated in the following chart:

Fig. No.	Item No.	Name of part	Method and quantity
17	7	Print and register cam.	Apply grease to all surfaces of the cam groove and the bearing roller.
18	2	Transfer lever restoring cam.	Apply a film on the working surface of the cam.
	8	Print hammer cam.	Apply sparingly to cam groove.
	9	Type wheel register lever cam.	Apply sparingly to cam groove.
19	20	Ball bearing_____	Apply a thin film on the outer circumference.
20	1	Cam stud plate___	Apply a thin film on each stud.
	5	Reciprocating and restoring cams.	Apply a thin film to all exposed surfaces.
21	1	Manual tape feed-out disabling cam.	Apply a thin film on the working surface of the cam.
	5	Clutch latch arm__	Thin film on surface contacted by stop arm.
	9	Selector camshaft and stop plate.	Thin film on working surfaces.

d. Friction Clutches (figs. 20 and 21). Apply oil as indicated in the chart below. Do not release the spring tension on friction clutches for periodic lubrication unless it is necessary to provide a thorough cleaning. If a thorough cleaning is necessary, release the tension on the TT–107/FG friction clutches by loosening the setscrews that hold the spring positioning collars. On the TT–107B/FG and TT–109/FG release the spring tension by loosening the cap screws in the adjusting collar enough to permit the collar to be rotated. Turn the motor by hand to rotate the friction clutch and apply oil. After the clutches are oiled set them to give approximately the required spring tension on each friction clutch and run the reperforator without printing or punching for about 5 minutes, then operate while a message is being received for about five minutes. When lubrication is completed, set the spring tension of the friction clutches as described in paragraphs 49, 66, 112, and 113.

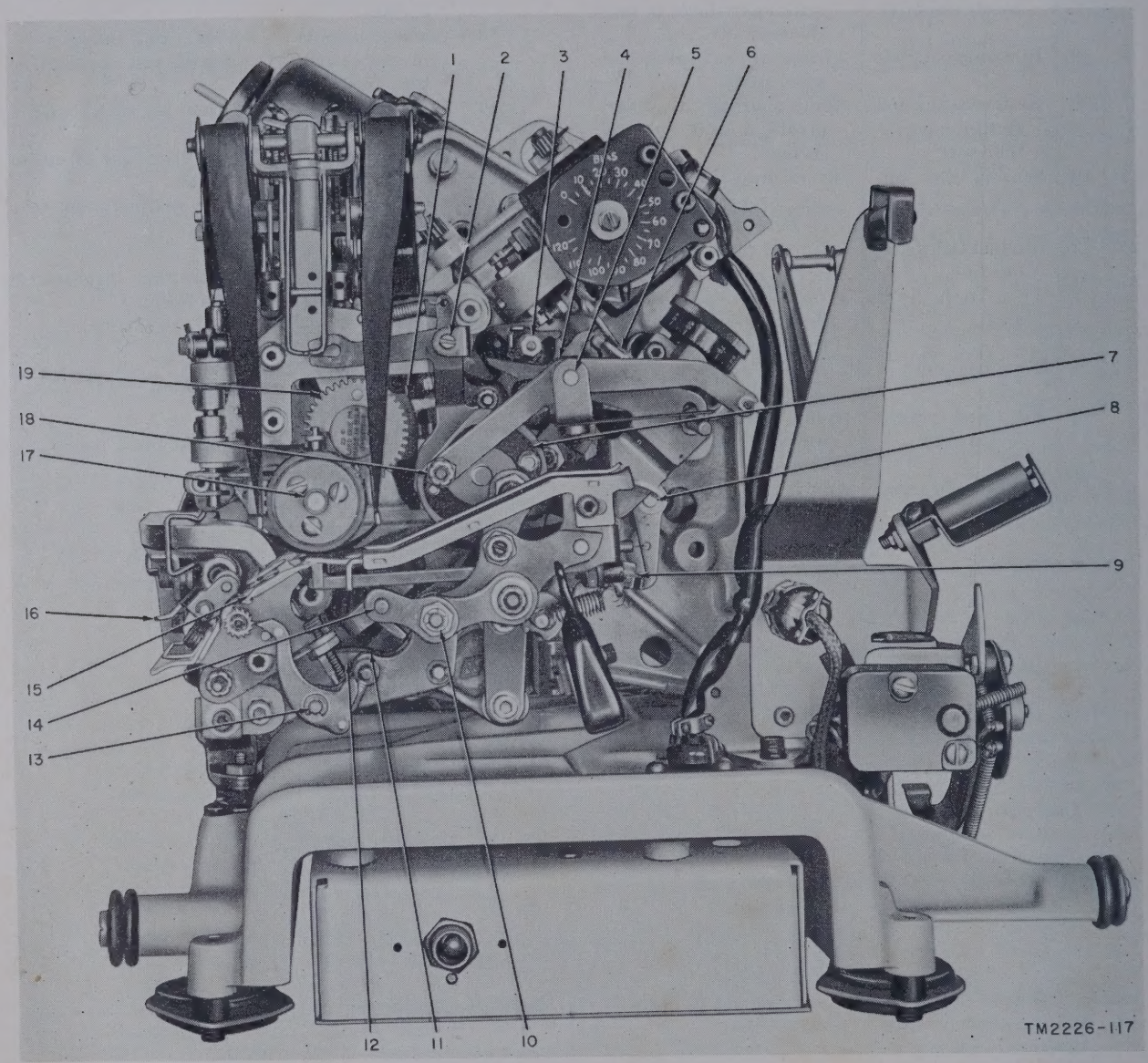
Fig. No.	Item No.	Name of part	Method and quantity
20	11	Function shaft friction clutch.	10 to 15 drops of oil along periphery of felt friction plates; apply sparingly to spring and collar.
21	6	Selector camshaft friction clutch.	10 to 15 drops of oil along periphery felt friction plates; apply sparingly to spring and collar.

e. Moving Parts. Apply oil at the following places:

Fig. No.	Item No.	Name of part	Method and quantity
17	1	Antibounce clutch_	Several drops into clutch.
	2	Ribbon feed cam follower eccentric stud.	Apply sparingly at both ends of the stud.
	3	Y-lever detents (TT–107B/FG and TT–109/FG).	Apply sparingly to all rubbing surfaces.
	4	Y-levers and separating washers (TT–107B/FG and TT–109/FG).	Apply sparingly to all rubbing and bearing surfaces.

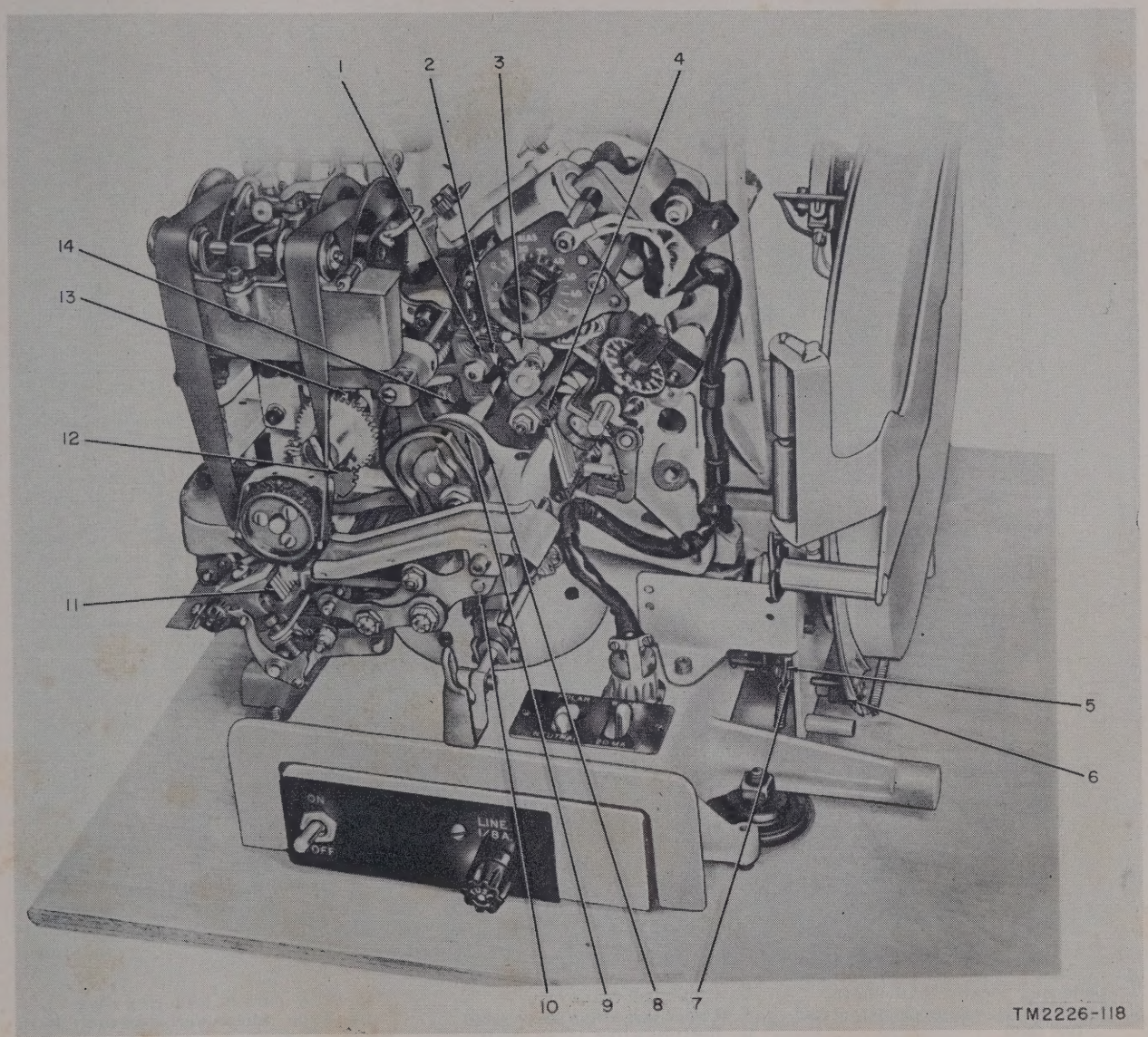
Fig. No.	Item No.	Name of part	Method and quantity
17	5	Tape puller arm pivot stud (TT–107B/FG and TT–109/FG).	1 drop at each working point of stud.
	6	Selector lever stop comb.	Apply sparingly to all rubbing surfaces.
	8	Transfer trip latch shaft.	Apply sparingly at both ends of shaft.
	9	Transfer lever trip latch.	Apply sparingly to latching surfaces.
	10	Punch arm pivot post.	Apply 5 drops of oil in oilhole of punch arm assembly.
	11	Punch lever pivot stud.	Several drops between levers and washers.
	12	Code hole punch levers.	Thin film on working surfaces.
	13	Feed pawl pivot	One drop at each end of pivot.
	14	Interference lever shaft.	Thin film on working surfaces.
	15	Tape feed sprocket.	2 drops in each hole on both sides of sprocket shaft.
	16	Tape retainer assembly.	1 drop at each end of tape retainer assembly.
	17	Type wheel post	Apply 2 drops at each end of post. Slide type wheel in and out several times for even lubrication.
	18	Tape puller arm roller.	1 or 2 drops on roller.
18	1	T-levers and separating washers.	Apply sparingly to all rubbing and bearing surfaces.
	3	Y-levers, friction plates, and separating washers (TT–107/FG).	Apply sparingly to all rubbing and bearing surfaces.
	4	Selector levers and separating washers.	Apply sparingly between levers and washers.
	5	Switch actuating arm latch.	Apply sparingly to both ends of latch.
	6	Tape-out alarm lever hub.	Apply sparingly to both ends of hub.
	7	Switch actuating lever pivot.	Apply sparingly to both ends of pivot.
	10	Punch lever stop pin.	Apply sparingly to entire length of pin.
	11	Code punch bars	Thin film on contact surfaces.
	13	Stop arm	1 drop each side of collar on shaft.
	14	Transfer lever roller.	1 drop between roller and stud.
19	1	Code-ring locking bail shaft.	Apply sparingly to all working surfaces and to pivot point of figures and levers latch.
	2	Type wheel reciprocating eccentric stud.	2 drops at upper end of stud.
	3	Code-ring locking bail cam follower.	Apply sparingly to latching surface.
	4	Ribbon retainers	Apply sparingly to ribbon retainer shaft pivot points.
	5	Ribbon sensing lever.	2 drops at each stud of sensing lever.
	6	Spool clip	Apply sparingly at pivots.
	7	Upper bell crank lever.	Apply sparingly to coupling of arm and type wheel reciprocating transfer lever.
	8	Upper bell crank lever stud.	Apply sparingly to upper bell crank lever stud.
	9	Reciprocating lever shaft.	2 drops at upper and lower bell crank shaft collars.
	10	Lower bell crank lever.	Apply sparingly to lower bell crank lever end.
	11	Detent lever	1 drop at each end of detent lever roller.
	12	Detent lever eccentric stud.	1 drop at each end of stud.
	13	Punch interference levers.	1 drop between interference levers and washers.
	14	Code rings	Thin film all along inner and outer working surfaces of each code ring. One drop between code rings and washers.
	15	Stop bars in code-ring cage.	2 drops at each end of all 32 stop bars.
	16	Type wheel reciprocating drive levers.	2 drops on drive pin and between levers and flat washers.
	18	Transfer lever shaft bearings.	1 drop between collars and bearings and on transfer lever shaft.
	19	Sliding drum clutch.	2 drops in oilhole in drum clutch.
20	2	Manual tape feed-out latching lever shaft.	1 drop at each lever pivot point of shaft.
	3	Manual tape feed-out trip latch.	1 drop at pivot and latching surface.
	4	Armature mounting shaft.	Apply sparingly to bearing points.
	6	Ribbon feed lever pawl.	Apply thin film on all working surfaces of ribbon feed pawl.

Fig. No.	Item No.	Name of part	Method and quantity
20	7	Driving link lever toggle assembly.	Apply thin film on all working surfaces of toggle assembly.
	8	Ribbon spool shaft.	2 drops at each ratchet of spool shaft.
	9	Reciprocating and restoring cam followers.	Apply sparingly to roller, pivots, and all rubbing surfaces.
	10	Sensing lever hub.	Several drops between sensing levers and spacers on hub.
21	2	Manual tape feed-out link.	1 drop at pivot points.
	7	Trip latch lever shaft.	2 drops at each end of sleeve bearings between the two latches.
	8	Tape feed-out shaft.	2 drops at all pivot points.
	10	Print and register levers shaft.	Apply sparingly to all working surfaces of the levers.
	11	Rangefinder cam.	Apply thin film on cam surfaces.
21	12	Ribbon feed cam surface.	Apply thin film on cam.
	13	Grooved spindle in end of selector camshaft.	Several drops between spindle and camshaft.
	14	Ribbon rollers.	1 drop at each end of roller.
22	1	Governor adjustment screw.	Apply sparingly to entire thread.
	2	Motor governor adjustment gear.	Apply sparingly on gear teeth.
	3	Governor worm.	1 or 2 drops in governor hub opening.
	4	Governor adjustment lever.	1 drop at each end.
23	1	Alarm lever (TT–107B/FG and TT–109/FG).	1 or 2 drops at pivot point.
	2	Lever latch (TT–107B/FG and TT–109/FG).	1 drop at pivot point.



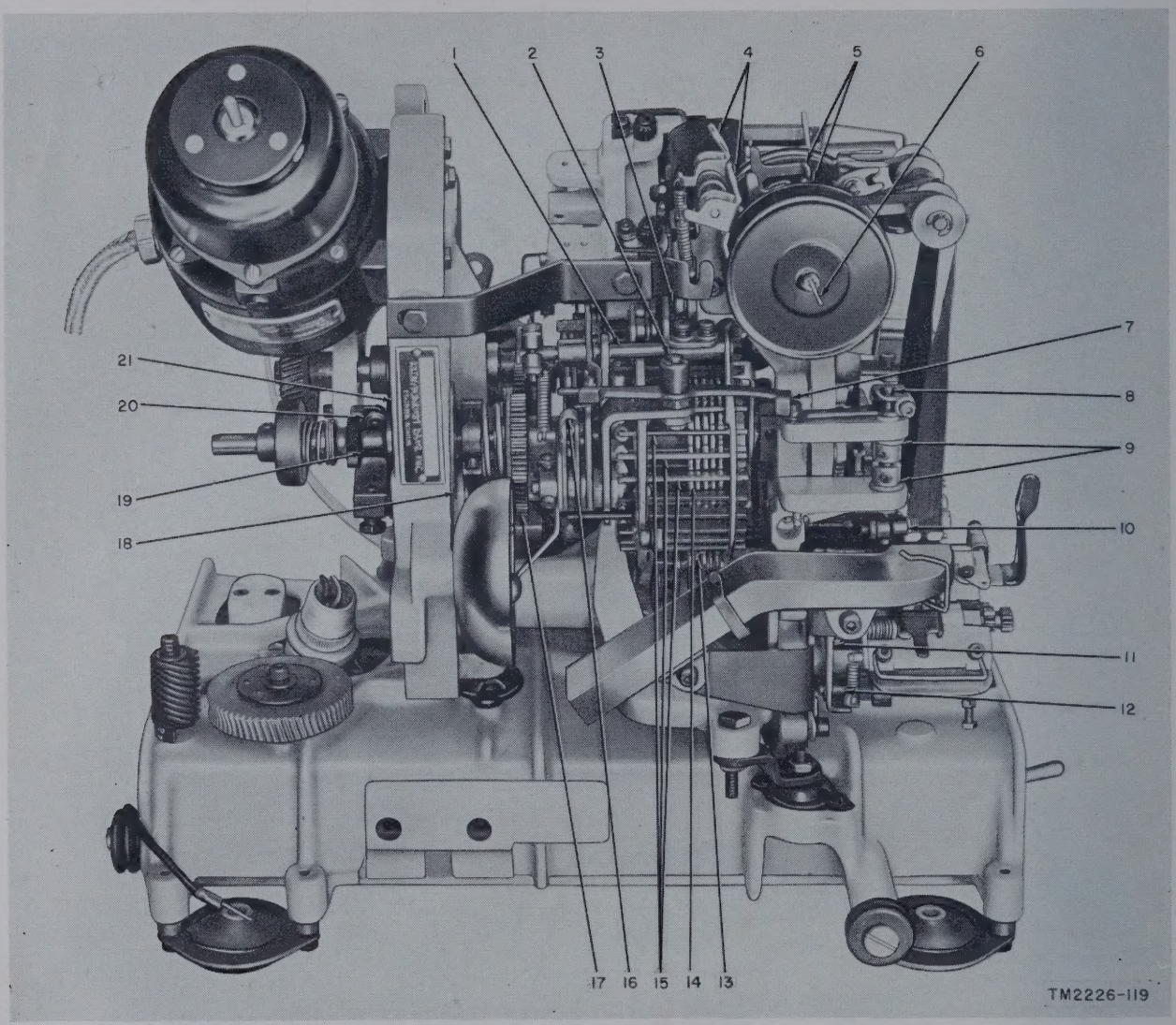
1 Antibounce clutch
2 Ribbon feed cam follower eccentric stud
3 Y-lever detents (TT–107B/FG and TT–109/FG)
4 Y-levers and separating washers (TT–107B/FG and TT–109/FG)
5 Tape puller arm pivot stud TT–107B/FG and TT–109/FG
6 Selector lever stop comb
7 Print and register cam
8 Transfer trip latch shaft
9 Transfer lever trip latch
10 Punch arm pivot post
11 Punch lever pivot stud
12 Code hole punch levers
13 Feed pawl pivot
14 Interference lever shaft
15 Tape feed sprocket
16 Tape retainer assembly
17 Type wheel post
18 Tape puller arm roller
19 Type wheel driven gear

Figure 17. Lubrication points, front view.



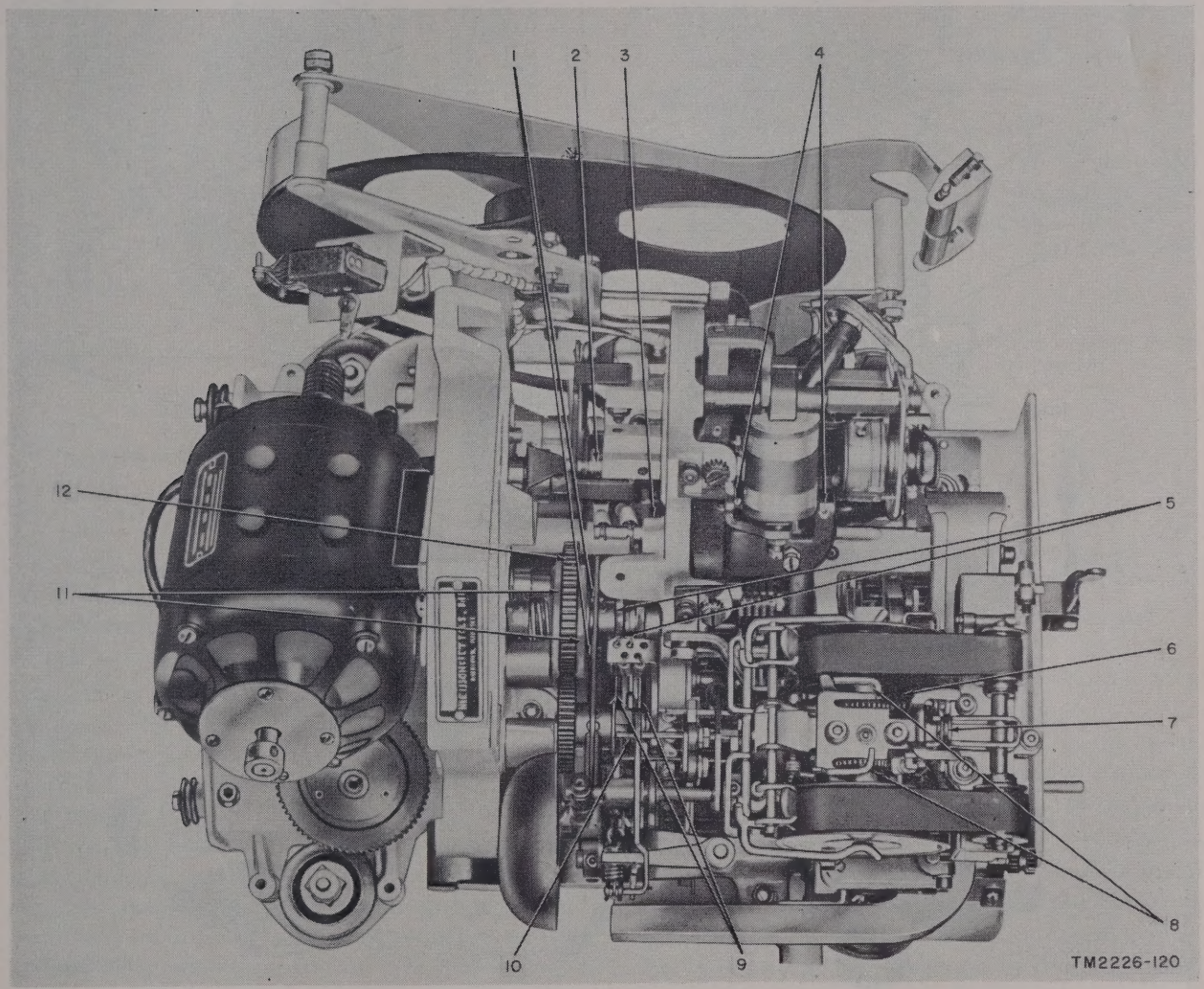
1 T-levers and separating washers
2 Transfer lever restoring cam
3 Y-levers, friction plates, and separating washers (TT–107/FG)
4 Selector levers and separating washers
5 Switch actuating arm latch
6 Tape-out alarm lever hub
7 Switch actuating lever pivot
8 Print hammer cam
9 Type wheel register lever cam
10 Punch lever stop pin
11 Code punch bars
12 Type wheel hub assembly
13 Stop arm
14 Transfer lever roller

Figure 18. Lubrication points, oblique view.



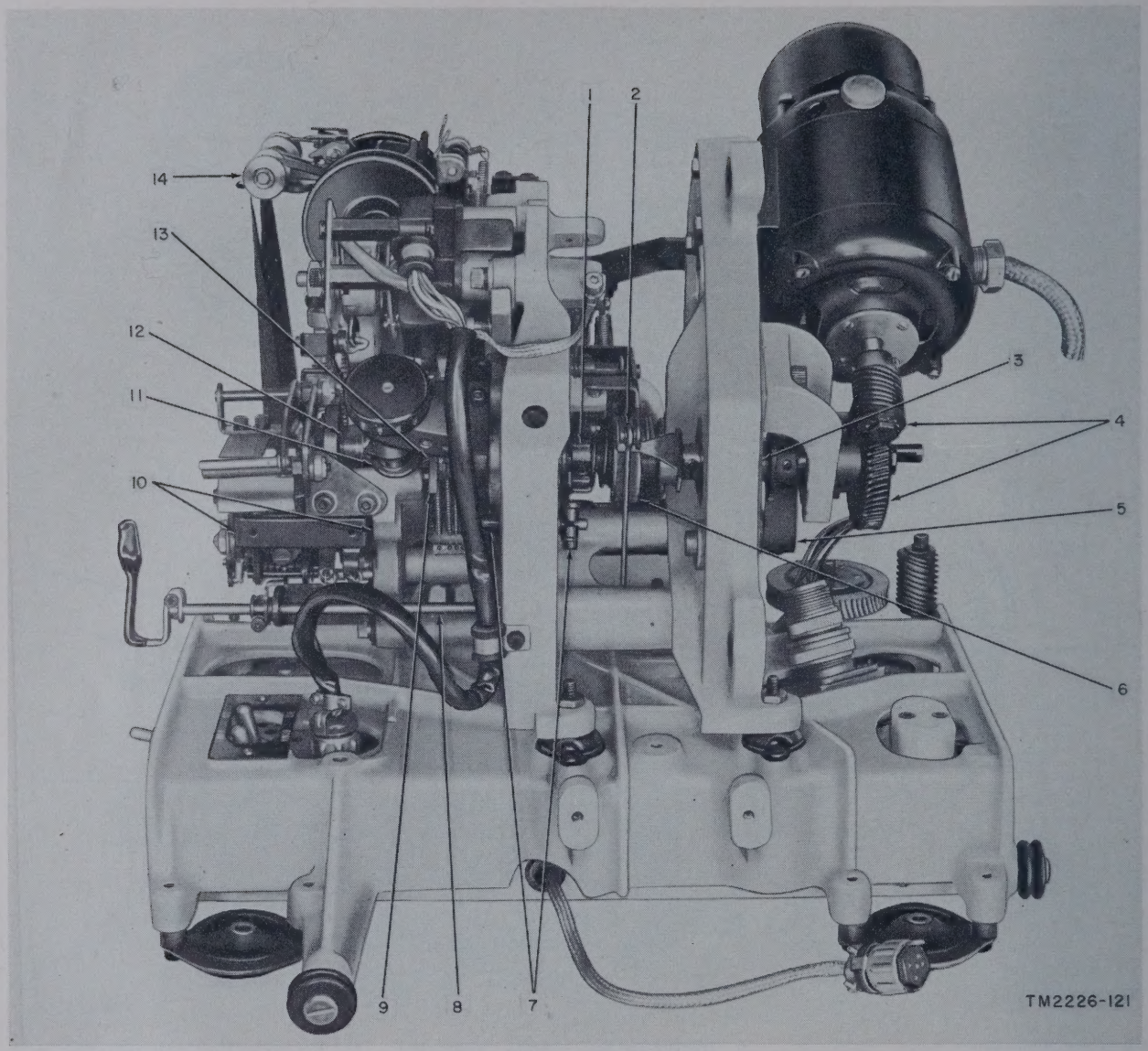
1 Code-ring locking bail shaft
2 Type wheel reciprocating eccentric stud
3 Code-ring locking bail cam follower
4 Ribbon retainers
5 Ribbon sensing lever
6 Spool clip
7 Upper bell crank lever
8 Upper bell crank lever stud
9 Reciprocating lever shaft
10 Lower bell crank lever
11 Detent lever
12 Detent lever eccentric stud
13 Punch interference levers
14 Code rings
15 Stop bars in code-ring cage
16 Type wheel reciprocating drive levers
17 Stop arm shaft driven gear
18 Transfer lever shaft bearings
19 Sliding drum clutch
20 Ball bearing
21 Function shaft driven gear

Figure 19. Lubrication points, left side view.



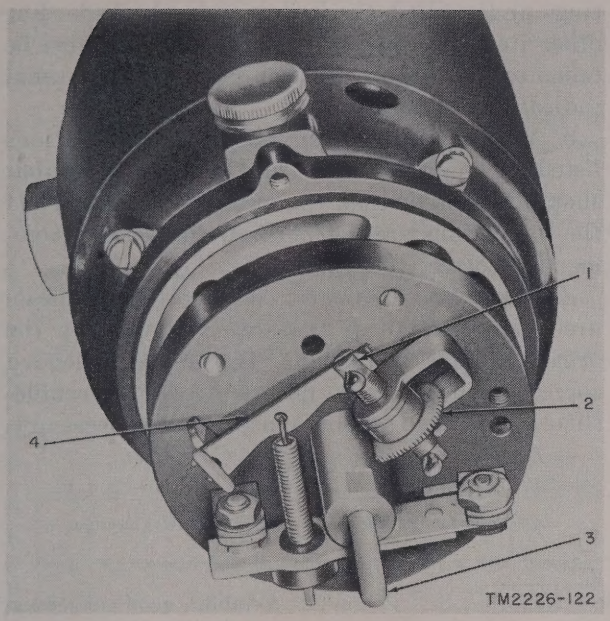
1 Cam stud plate
2 Manual tape feed-out latching lever shaft
3 Manual tape feed-out trip latch
4 Armature mounting shaft
5 Reciprocating and restoring cams
6 Ribbon feed lever pawl
7 Driving link lever toggle assembly
8 Ribbon spool shaft
9 Reciprocating and restoring cam followers
10 Sensing lever hub
11 Function shaft friction clutch
12 Function shaft drive gear

Figure 20. Lubrication points, top view.



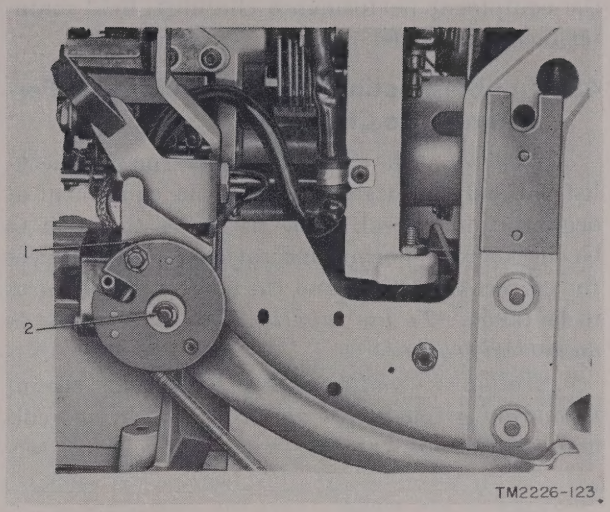
1 Manual tape feed-out disabling cam
2 Manual tape feed-out link
3 Function shaft drive gear
4 Drive gearset
5 Clutch latch arm
6 Selector camshaft friction clutch
7 Trip latch lever shaft
8 Tape feed-out shaft
9 Selector camshaft and stop plate
10 Print and register levers shaft
11 Rangefinder cam
12 Ribbon feed cam surface
13 Groved spindle in end of selector camshaft
14 Ribbon roller

Figure 21. Lubrication points, right side view.



1 Governor adjustment screw
2 Motor governor adjustment gear
3 Governor worm
4 Governor adjustment lever

Figure 22. Motor governor, showing lubrication points (TT–109/FG).



1 Alarm lever
2 Lever latch

Figure 23. Tape alarm lever, showing lubrication points (TT–107B/FG and TT–109/FG).

Section IV. TROUBLESHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

40. General

The troubleshooting information presented in this section consists of a series of operational, mechanical, and electrical checks designed to lead maintenance personnel to the specific part, adjustment, or electrical component that is causing the trouble in the equipment. Only those procedures for sectionalizing, localizing, isolating, and correcting troubles that can be accomplished with the tools and test equipment authorized and available for organizational maintenance personnel are described in this section. If the corrective measures listed do not restore the equipment to normal operation, troubleshooting by maintenance personnel at filed maintenance level is required.

41. Visual Inspection

a. Failure of equipment to operate properly usually is caused by one or more of the following visible faults:

(1) Improperly connected power cord.
(2) Burned-out fuse in terminal box (fig. 8).
(3) Worn, broken, burned-out, or disconnected cord or plug.
(4) Wires broken by excessive vibration.
(5) Loose ground connection.
(6) Visibly worn or damaged mechanical part.

b. When failure or troublesome operation occurs and the cause is not immediately apparent, check as many of these items as is practicable before starting a detailed examination. If possible, obtain information from the operator of the equipment regarding the performance at the time trouble occurred.

c. Visually inspect as much of the line system as possible for obvious trouble.

42. Sectionalizing Trouble

When the cause of trouble cannot be found by simple visual inspection (par. 41), follow the procedure outlined in the equipment performance checklist (par. 43). In this list it is assumed that the reperforator is connected to a signal line, that a good fuse is inserted properly in each fuse holder, and that the reperforator is loaded properly with paper tape. Perform the steps in the order listed. If the trouble cannot be found by means of

the equipment performance checklist, field maintenance is required.

43. Troubleshooting (Using Equipment Performance Checklist)

a. General. The equipment performance checklist will help to locate trouble in the equipment at organizational level. The list gives the item to be checked, the normal indications and tolerances for correct operation, and the corrective measures to be taken. *To use this list, follow the items in numerical sequence.*

b. Action or Condition. For some items, the information given in the action or conditions column consists of various switch and control settings under which the item is to be checked. For other items, it represents an action that must be taken to check the indication given in the normal indications column.

c. Normal Indications. The normal indications listed include the visible and audible signs that should be noted when the items are checked. If the indications are not normal, apply the recommended corrective measures.

d. Corrective Measures. The corrective measures listed are those that can be made by the organizational technician. If the recommended corrective measures do not yield results, troubleshooting at field maintenance level is necessary.

e. Equipment Performance Checklist.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
	1	Ground	Check connections. Be sure all power connections are in OFF position while checking.	None	Establish good connection (par. 13).
	2	Power	Power cord plugged in.	None	None.
P	3	Power switch	In OFF position	None	None.
R	4	Signal line connection	Signal cords plugged into line provided for type of service desired.	None	Connect as required (par. 18).
E P A R A T O R Y	5	Paper tape	Check for adequate supply; be sure that paper tape is positioned correctly through its guides, under type wheel, and through punch and die assembly.	None	Replenish or adjust paper tape (par. 22*b*).
	6	Inking ribbon	In proper position around spools and rollers, and passed through guide slots.	None	Adjust inking ribbon.
S T A R T	7	Power switch	Operate to ON	Motor starts, lamp lights	Check fuses; check power source connection (par. 13). Examine motor, (par. 33*c*).
	8	Motor speed (TT–109/FG only).	Adjust according to instruction in paragraph 15*a*.		

	Item No.	Item	Action or condition	Normal indications	Corrective measures
	9	Bias potentiometer (TT–107/FG).	Adjust according to instructions in paragraph 15*c*.		
	10	Rangefinder	Adjust according to instructions in paragraph 15*d*.		
EQUIPMENT PERFORMANCE	11	Tape feed	Operate manual tape feed-out lever counterclockwise.	Tape should feed properly.	Adjust tape feed mechanism (par. 80).
	12	Type wheel	Receive test message	Should be projected and restored for each operation and should shift to figures position properly.	Check bell crank assemblies and operation of the type wheel drive lever (par. 50).
	13	Inking ribbon feed mechanism.	Receive test message	Inking ribbon should feed as every other character is typed.	Check inking ribbon in guides and ribbon feed pawl action (par. 95).
	14	Code and feed punches	Receive test message	Code holes well-formed without tearing.	Check punch arm, code punch lever, and code punches (par. 79).
	15	Signal bell mechanism	Receive S code group with unit in figures shift position.	Signal bell should ring	Check signal bell sensing lever, clapper, and gong (par. 61).
	16	Manual tape feed-out lever.	Move lever to left	Paper tape should feed out; BLANK symbol will print on paper tape.	Check transfer lever trip latch, and manual tape feed-out linkage (par. 115).
	17	Message tape supply and tape-alarm buzzer.	Tape low or roll removed from reel.	If tape supply is low, switch should operate and buzzer should sound.	Check switch and tape alarm lever in tape supply group (par. 124).
STOP	18	Power switch	Turn to OFF	Motor should stop and light should extinguish.	Check switch.

Section V. REPERFORATOR ADJUSTMENT PROCEDURES

44. General

This section contains the requirement and adjustment procedures for the reperforator. Complete the individual checks and if required make the necessary adjustments. Adjustments are arranged in sequence for a complete readjustment of the reperforator. Adjustments not otherwise identified apply to all units, those applicable only to the TT–107/FG, the TT–107B/FG, or the TT–109/FG are so identified. When making individual adjustments, check all related adjustments. When it is necessary to remove parts or sub-assemblies to make an adjustment refer to the specific removal and replacement instructions in paragraphs 164 through 213.

45. Bearing Positioning Adjustments (TT–107B/FG)

(fig. 24)

a. Requirement. The ball bearings are to be centered in the frame.

b. Adjustment. Insert an allen wrench through the clearance holes in the frame and loosen the machine screws that clamp the ball bearings in the frame. Position the bearings in the frame to meet the requirement. Tighten the machine screws.

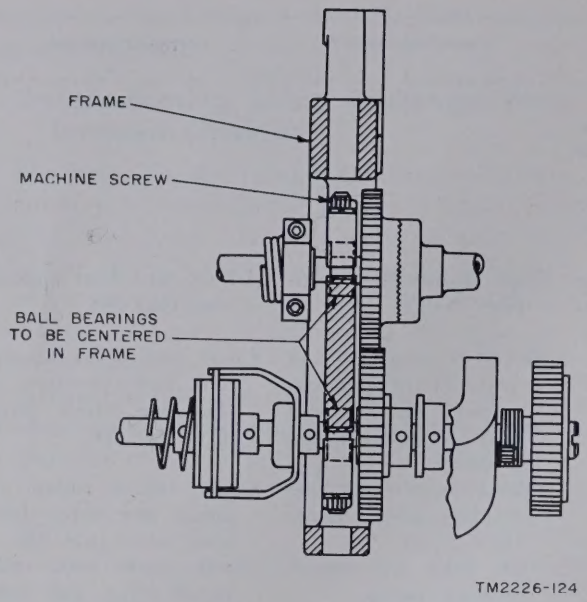


Figure 24. Bearing positioning adjustment (TT–107B/FG).

46. Function Plate and Stop Bars Clearance Adjustment

(fig. 25)

a. Requirement. There should be .001- to .010-inch clearance between the function plate and the function stop bar having the least amount of clearance.

b. Adjustment. Loosen the machine screws on the function plate. Turn the plate clockwise or counterclockwise until the requirement is met; tighten the machine screws. Check the requirement.

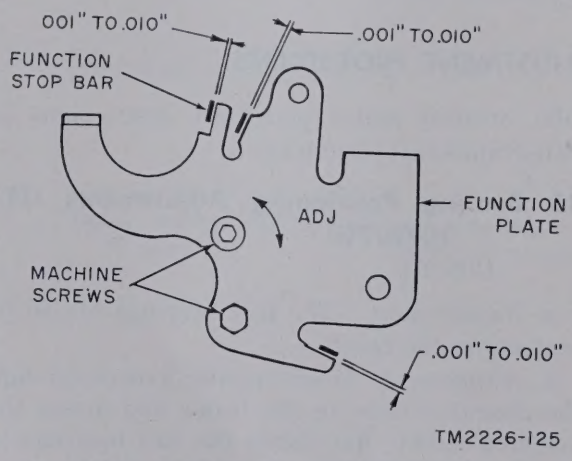


Figure 25. Function plate and stop bars clearance adjustment.

47. Sensing Levers Stacking Clearance Adjustment

(fig. 26)

a. Requirements.

(1) The hub of the code selecting guide plate should project .003-inch maximum beyond the type wheel reciprocating cam follower.

(2) The hub of the cam lever assembly should project .003-inch maximum beyond the sensing lever spacer.

b. Adjustments.

(1) Remove enough laminations from the laminated spacer to meet the requirement specified in *a*(1) above.

(2) Remove enough laminations from the laminated sensing lever spacer to meet requirement specified in *a*(2) above. When checking, be sure no clearances are present between the sensing levers and spacers.

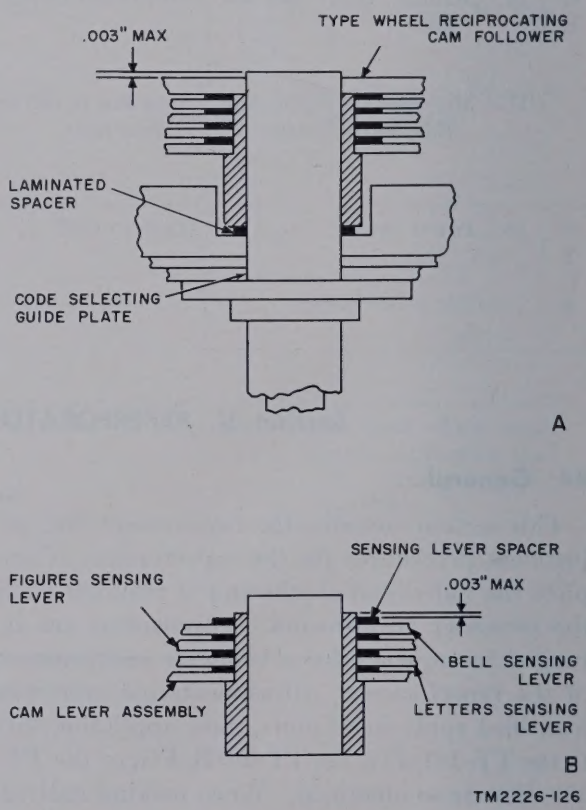


Figure 26. Sensing levers stacking clearance adjustment.

(3) Check related adjustments (par. 48).

Note. Spacers are made of brass laminations bonded together. Each lamination is .002-inch thick. Check the adjustment requirements carefully to avoid removal of too many laminations. Use a knife blade to separate each lamination for removal. Remove all burrs from laminated spacers.

48. Code Ring End Play and Function Sensing Levers Clearance Adjustment

(fig. 27)

a. Requirement.

(1) The clearance between the ball retainer and the code-ring collar should be .002 to .004 inch.

(2) There should be .002- to .005-inch clearance between the thrust bearing and the stop arm shaft driven gear.

b. Method of Checking.

(1) Check the clearance by inserting a flat feeler gage from the bottom of the code-ring cage between a code ring and a ball of the ball retainer.

(2) Check the clearance by inserting a flat feeler gage between the stop arm shaft driven gear and the thrust bearing.

c. Adjustment.

(1) Insert an allen wrench through the top stop bars, through the hole in the code cage spacer into a setscrew in the code-ring collar and loosen the setscrew.

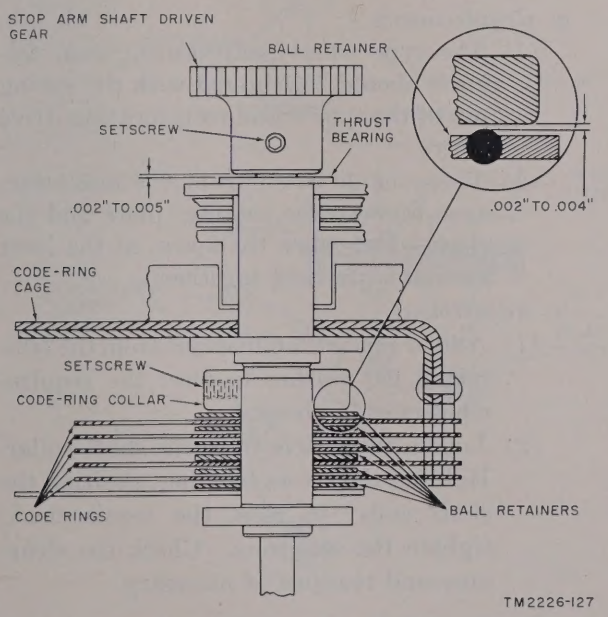


Figure 27. Code ring end play and function sensing levers clearance adjustment.

Loosen the other setscrew and move the code-ring collar toward or away from the code rings to meet the requirement in *a*(1) above. Tighten the setscrews in the code-ring collar and recheck the requirement.

(2) Loosen the setscrews in the stop arm shaft driven gear and reposition to meet the requirement in *a*(2) above. Tighten the setscrews and check the requirement.

49. Function Shaft Parts Alinement Adjustment

(fig. 28)

a. Requirements.

(1) The flat washer and the transfer lever cam should be tight against the opposite sides of the ball bearing.

(2) The function shaft drive gear on the function shaft should be centered with the stop arm shaft driven gear.

(3) There should be .010- to .015-inch clearance between the sliding drum clutch and the function shaft gear when the clutch latch arm is engaged by the sliding drum clutch.

b. Method of Checking.

(1) Push and pull on the transfer lever cam and check for clearance between the transfer lever cam and the ball bearing.

(2) Visually check the alinement between the stop arm shaft driven gear and the function shaft drive gear.

(3) Make sure the machine is in the stop position and the clutch latch is engaged by the sliding drum clutch. Check the clearance between the function shaft gear and the sliding drum clutch with a flat feeler gage. Both fingers of the sliding drum clutch should be checked.

c. Adjustments.

(1) Loosen the transfer lever cam setscrews and slide the function shaft until it pushes the flat washer tight against the ball bearing. Hold the function shaft and slide the transfer lever cam tight against the ball bearing. Tighten the transfer lever cam setscrews and recheck the requirement.

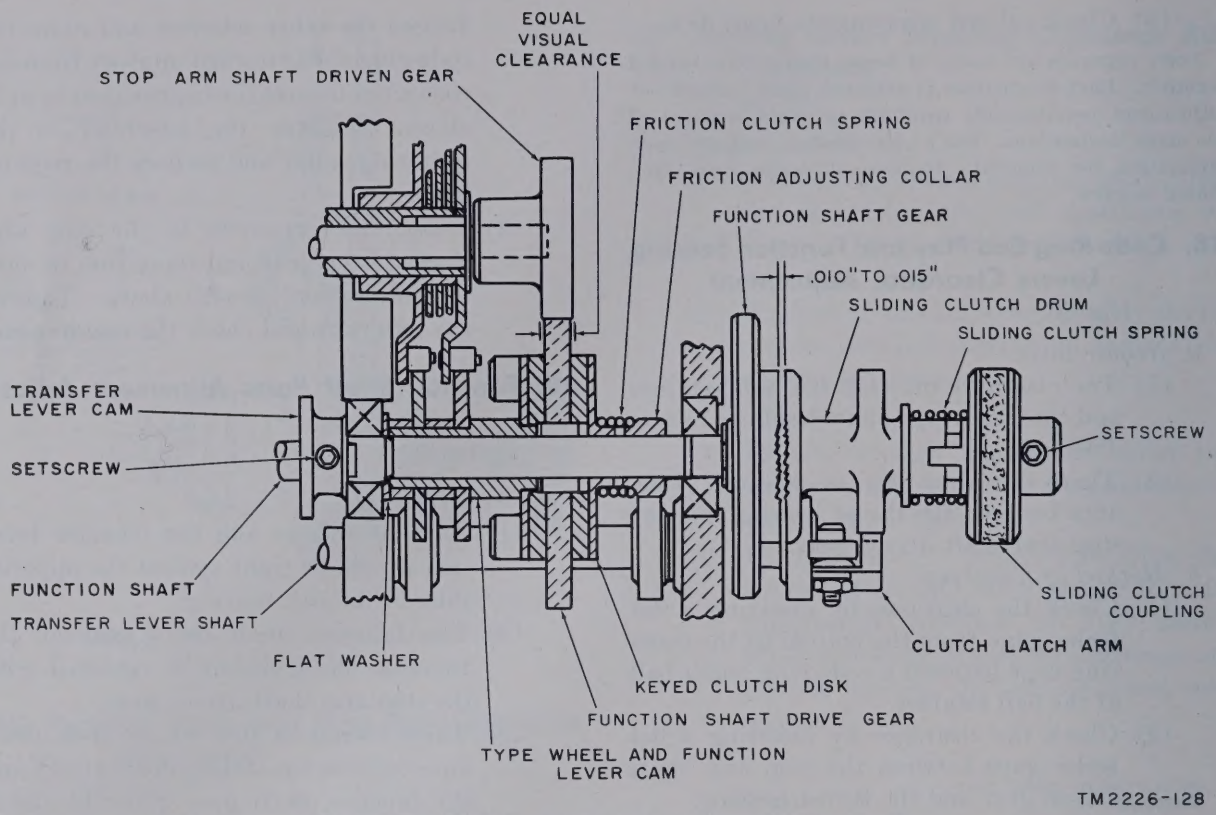


Figure 28. Function shaft parts alinement adjustment.

(2) Loosen the type wheel and function lever cam setscrews. While maintaining a pressure on the keyed clutch disk, move the type wheel and function lever cam to meet the requirement; tighten the setscrews.

(3) Loosen the setscrews in the transfer lever shaft collar and loosen the function clutch latch screw of the clutch latch arm. Shift the position of the clutch latch arm axially until the requirement is met. Slide the transfer lever shaft collar up tight against the clutch latch arm and tighten only the setscrews in the transfer lever shaft collar so as to locate the position of the clutch latch arm. Adjust the clutch latch arm (par. 56).

Note. The TT–107B/FG has a clamping screw instead of setscrews in the transfer lever shaft collar.

(4) Check related adjustments (pars. 56 and 57).

50. Type Wheel Reciprocating Levers Clearance Adjustment

(fig. 29)

a. Requirements.

(1) The type wheel reciprocating cam follower should be centered with the spring pin of the type wheel reciprocating drive levers.

(2) There should be a .001- to .005-inch clearance between the retainer plate and the shaft collar when the levers of the lever assembly are held together.

b. Adjustment.

(1) Add or remove laminations from the laminated flat washer to meet the requirement in *a*(1) above.

(2) Loosen the setscrews in the shaft collar. Holding the levers together, position the shaft collar to meet the requirement; tighten the setscrews. Check the clearance and readjust if necessary.

Note. Remove all burrs from laminated flat washers.

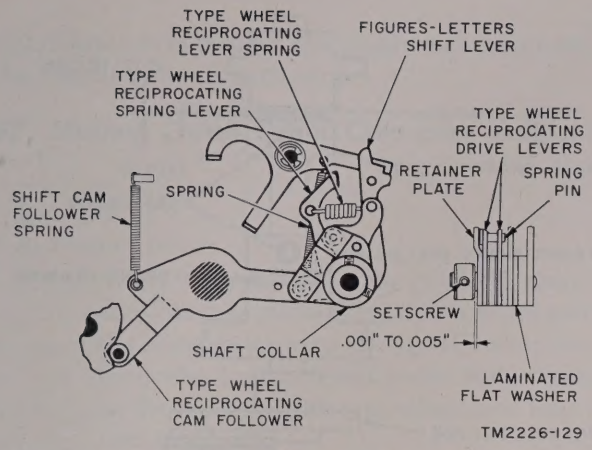


Figure 29. Type wheel reciprocating levers clearance adjustment.

51. T-Levers and Selector Y-Lever Alinement (TT–107/FG)

(A, fig. 30)

a. Requirement. T-levers should be in line visually with the selector Y-levers.

b. Adjustment. With the rear shaft collar loose, loosen the setscrews and slide the transfer lever in or out to meet the requirement. Holding the transfer lever in position, slide the shaft collar tight against the bearing and tighten the setscrews. Check related adjustments (pars. 49 and 54).

52. T-Lever and Selector Y-Lever Alinement (TT–107B/FG)

(B, fig. 30)

a. Requirement. T-levers should be in line visually with the selector Y-levers.

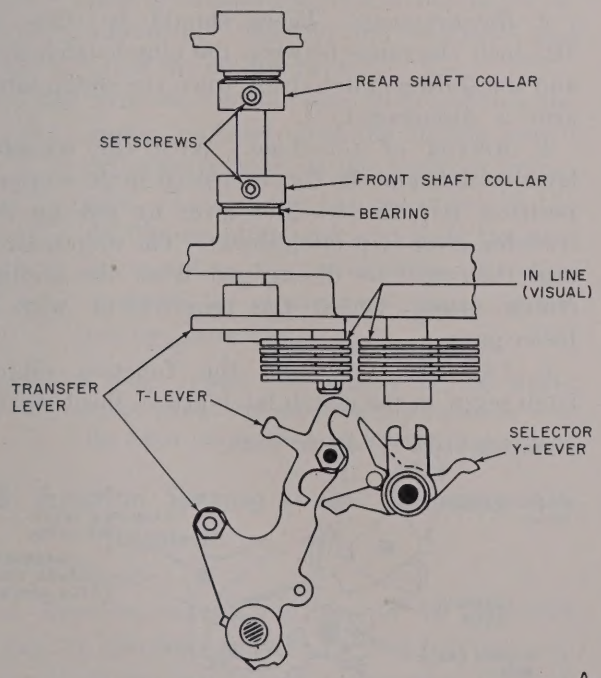
b. Adjustment. With the rear shaft collar loose, loosen the clamping machine screws and slide the transfer lever in or out to meet the requirement. Holding the transfer lever in position, slide the shaft collar tight against the bearing and tighten the clamping machine screws. Check related adjustments (pars. 49 and 53).

53. Transfer Lever Shaft End Play Adjustment (TT–107/FG)

(B, fig. 31)

a. Requirement. There should be .002- to .005-inch clearance between the rear shaft collar and the rear bearing when the front shaft collar is tight against the front bearing.

b. Adjustment. Loosen the setscrews and slide the front shaft collar tight against the front bearing. With a feeler gage between the rear shaft collar and the rear bearing, tighten the setscrews.



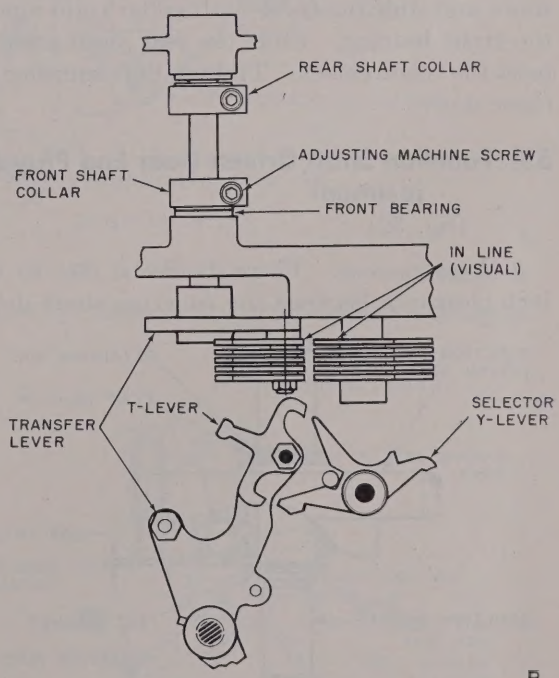


Figure 30. T-lever and selector Y-lever alinement.

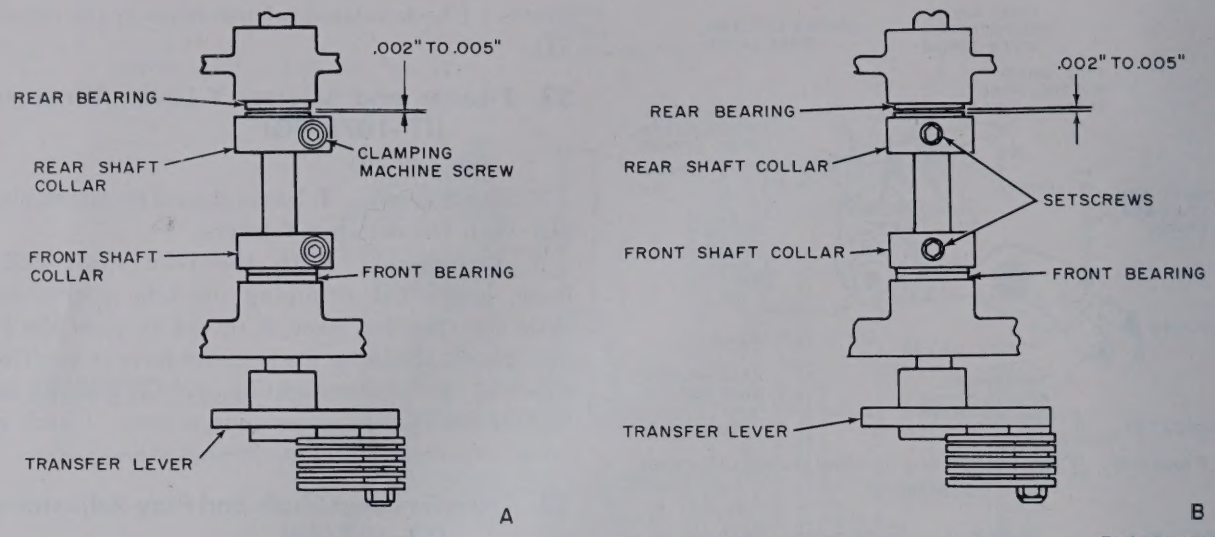


Figure 31. Transfer lever shaft end play adjustment.

54. Transfer Lever Shaft End Play Adjustment (TT–107B/FG)

(A, fig. 31)

a. Requirement. There should be .002- to .005-inch clearance between the rear shaft collar and the rear bearing when the front shaft collar is tight against the front bearing.

b. Adjustment. Loosen the clamping machine screw and slide the front shaft collar tight against the front bearing. Slide the rear shaft collar to meet the requirement. Tighten the clamping machine screw.

55. Function Shaft Driven Gear End Play Adjustment

(fig. 32)

a. Requirement. There should be .002- to .010-inch clearance between the function shaft driven gear and the flat washer when the driven gear is held against the rear flat washer and retainer ring.

b. Adjustment. Remove the retainer ring and add or remove flat washers until the requirement is met. Replace the retainer ring and recheck the requirement.

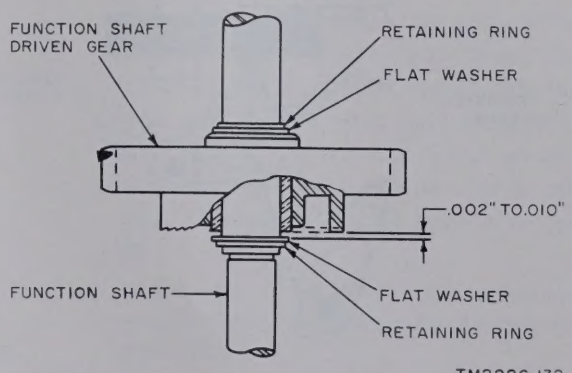


Figure 32. Function shaft driven gear end play adjustment.

56. Clutch Latch Arm Adjustment

(fig. 33)

a. Requirement. There should be .015- to .025-inch clearance between the clutch latch arm and the sliding clutch drum when the clutch latch arm is disengaged.

b. Method of Checking. With the transfer lever latched and the function shaft in the stopped position, trip the transfer lever by pulling the transfer lever trip latch down. The clutch latch arm then will be disengaged from the sliding clutch drum. Check the requirement with a feeler gage.

c. Adjustment. Loosen the function clutch latch screw in the clutch latch arm. Position the

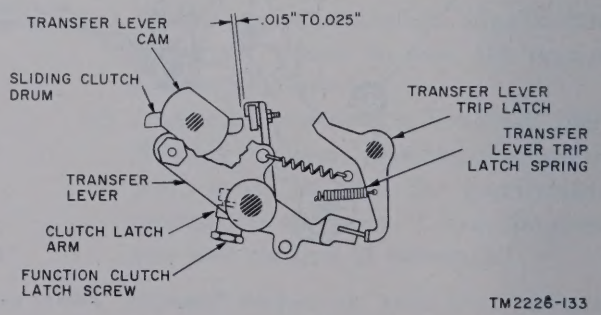


Figure 33. Clutch latch arm adjustment.

clutch latch arm to meet the requirement; tighten the function clutch latch screw.

57. Sliding Clutch Drum Clearance Adjustment

(fig. 34)

a. Requirements.

(1) There should be .002- to .008-inch clearance between the sliding clutch drum and the clutch latch arm (B, fig. 34) when the type wheel reciprocating cam follower is in the indent of the type wheel and function lever cam.

(2) There should be a clearance of .080- to .100-inch between the sliding clutch coupling and the sliding clutch drum (A, fig. 34), when the sliding clutch drum is fully engaged with the function shaft drive gear.

b. Adjustments.

(1) Be sure the type wheel reciprocating cam follower is in the indent of the type wheel and function lever cam. Loosen the setscrews in the sliding clutch coupling and turn the sliding clutch coupling clockwise or counterclockwise to obtain the requirement. Tighten the setscrews and check the requirements.

(2) Trip the transfer lever latch and turn the motor by hand until the sliding clutch drum fully engages the function driven gear. Loosen the two setscrews in the flexible coupling disk and shift the flexible coupling disk in the proper direction to obtain the required clearance; tighten the two setscrews.

Note. Check both fingers of the sliding clutch drum and establish the clearance with the finger having the least amount of clearance.

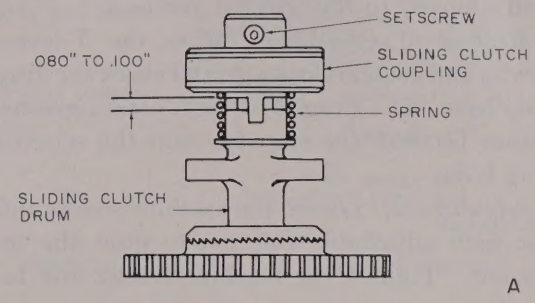
58. Function Sensing Levers Clearance Adjustment

(fig. 35)

a. Requirement. There should be .005-inch minimum clearance between the bell function stop bar and its associated sensing lever when the high point of the restoring cam is against the cam lever assembly and none of the stop bars is in the selected position.

b. Adjustment. Turn the motor by hand until the cam lever assembly is against the high point of the restoring cam. Loosen the hexagonal nut and turn the restoring lever eccentric until the requirement is met; tighten the hexagonal nut and check the clearance. Check related adjustment (par. 61).

Note. Check other function stop bars for a clearance.



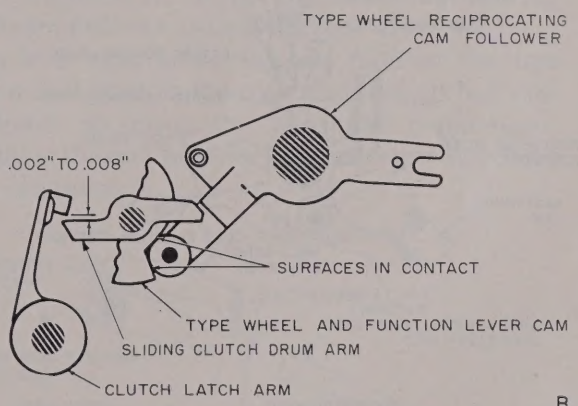


Figure 34. Sliding clutch drum clearance adjustment.

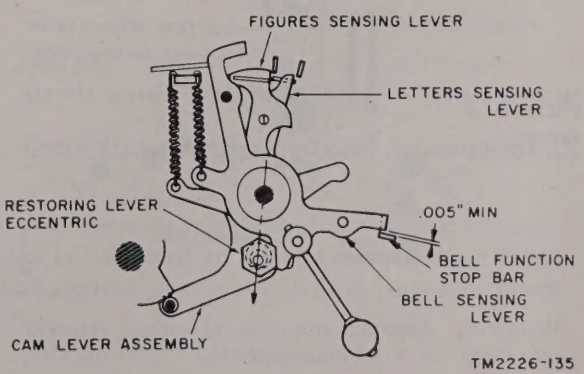


Figure 35. Function sensing levers clearance adjustment.

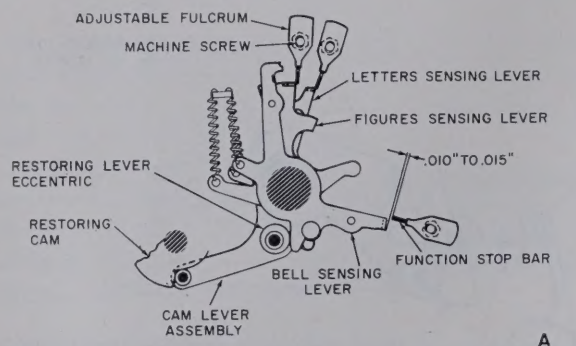
59. Function Stop Bars Adjustable Fulcrum Alinement (TT–107/FG)

(A, fig. 36)

a. Requirement. There should be a .010- to .015-inch clearance between the tops of each function sensing lever and the associated stop bar when the cam lever assembly is against the low point of the restoring cam and each function stop bar is individually moved to the selected position.

b. Method of Checking. Move the T-levers clockwise and counterclockwise and check for drag on stop bars. If a drag is present, obtain greater clearance between the stop bar and the selected sensing lever.

c. Adjustment. Loosen the machine screws and adjust each adjustable fulcrum to meet the requirement. Tighten the machine screws and recheck the clearance.



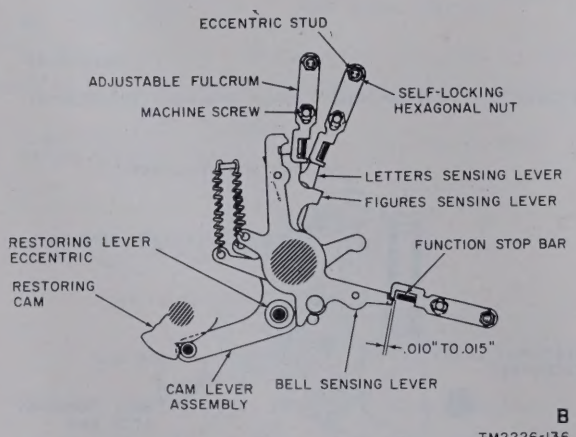


Figure 36. Function stop bars adjustable fulcrum alinement.

60. Function Stop Bars Adjustable Fulcrum Adjustment Fulcrum (TT–107B/FG)

(B, fig. 36)

a. Requirement. There should be .010- to .015-inch clearance between the top of each function sensing lever and the associated stop bar when the cam lever assembly is against the low point of the restoring cam and each function stop bar is individually moved to the selected position.

b. Method of Checking. Move the T-levers clockwise and counterclockwise, and check for drag on the stop bars. If a drag is present, obtain greater clearance between the stop bar and the selected sensing lever.

c. Adjustment. Loosen the machine screw that holds the adjustable fulcrum. Loosen the self-locking hexagonal nut that holds the eccentric stud. Turn the eccentric stud with a screwdriver until the requirement is met. Hold the eccentric stud and tighten the self-locking hexagonal nut. Tighten the machine screw and recheck the clearance. Use the same procedure for all three adjustable fulcrums.

61. Signal Bell Clapper Adjustment

(fig. 37)

a. Requirement. The signal bell should ring with a clear tone when the S code group is received while the machine is in the figure-shift position.

b. Adjustment. Loosen the setscrew in the bell sensing lever. Position the signal bell clapper approximately $\frac{3}{32}$ inch from the signal bell, until the requirement is met.

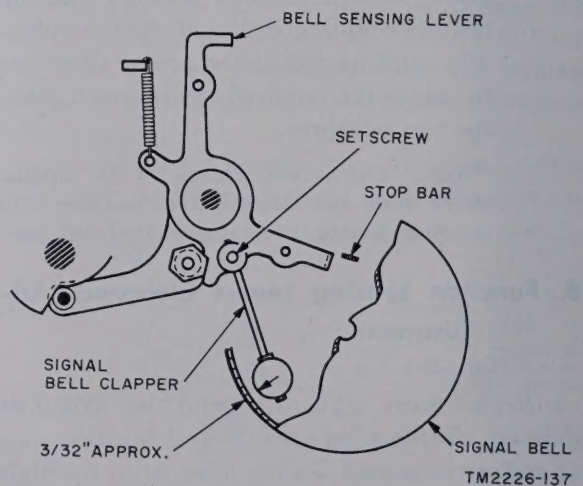


Figure 37. Signal bell clapper adjustment.

62. Transfer Lever Roller Stud Adjustment

(fig. 38)

a. Requirement. There should be .007- to .020-inch clearance between the transfer lever and the transfer lever trip latch when the transfer lever roller is on the high portion of the transfer lever cam.

b. Adjustment. Loosen the self-locking hexagonal nut and set the transfer lever roller stud for maximum eccentricity. Manually rotate the function shaft until the roller is on the high portion of the transfer lever cam. Turn the transfer lever roller stud in either direction until the requirement is met. Tighten the self-locking hexagonal nut and check the clearance.

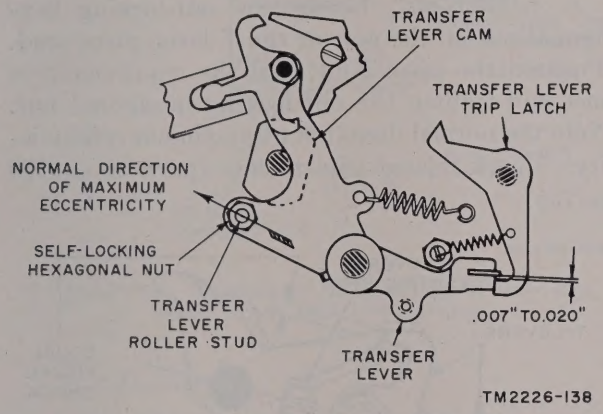


Figure 38. Transfer lever roller stud adjustment.

63. Code-Ring Locking Bail Adjustment

(fig. 39)

a. Requirement. When in the locking position, the code-ring locking bail should rest against the bottom of the locking notches in the code rings for both mark and space positions of the code rings.

b. Adjustment. Loosen the machine screws in the code-ring locking bail. Position the code-ring locking bail until the requirement is met. Tighten the machine screws and recheck the requirement.

64. Code-Ring Locking Bail Cam Follower Clearance Adjustment

(fig. 40)

a. Requirement. There should be a .015- to .025-inch clearance between the code-ring locking bail and the high part of the code ring when the code-ring locking bail cam follower is against the top of the type wheel and function lever cam.

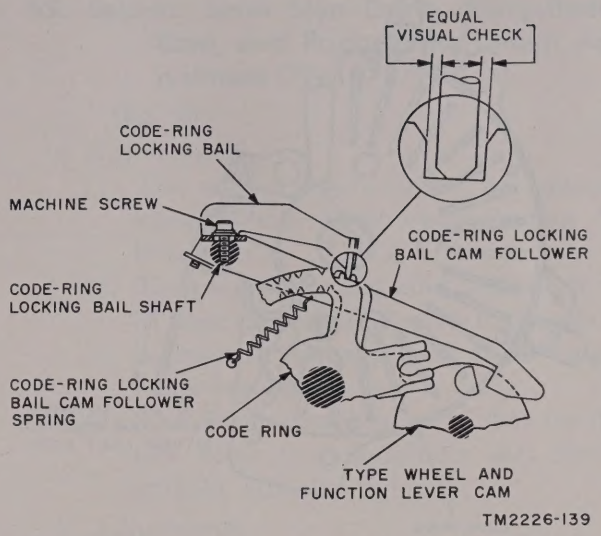


Figure 39. Code-ring locking bail adjustment.

b. Adjustment. With the code-ring locking bail cam follower against the type wheel and function lever cam, loosen the cam follower machine screw and position the code-ring locking bail cam follower to meet the clearance requirement. Tighten the cam follower machine screw and check the clearance.

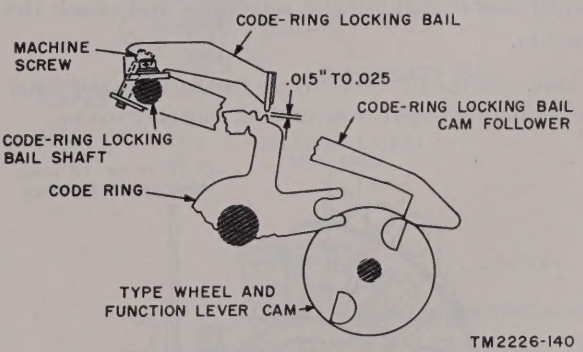


Figure 40. Code-ring locking bail cam follower clearance adjustment.

65. Code Rings Actuating Load Adjustment

(fig. 41)

a. Requirement. A force of 12 ounces maximum should be required to move the code ring from mark to space position and from space to mark position.

b. Adjustment. Correct any burr on working surfaces of the code-ring cage. Replace distorted code rings with a new set.

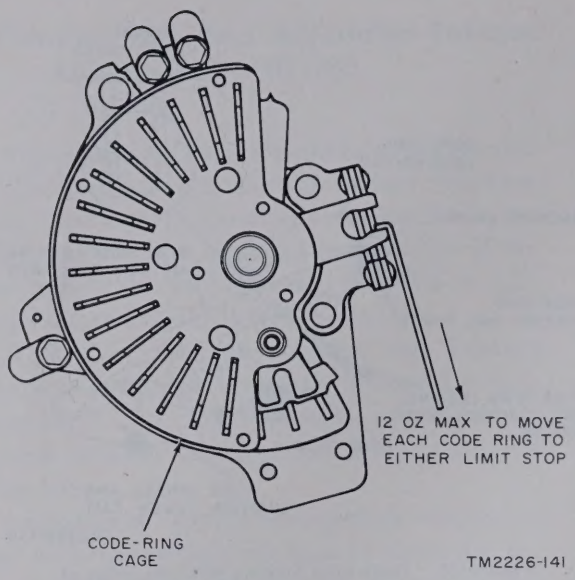


Figure 41. Code rings actuating load adjustment.

66. Stop Arm Torque Adjustment

(fig. 42)

a. Requirement. With the motor running and the function shaft rotating, a pull of 12 to 17 ounces is required to hold the stop arm stationary.

b. Adjustment. With the motor off, loosen the setscrews on the friction adjusting collar. Move the friction adjusting collar in or out to meet the requirement; tighten the setscrews and check the tension.

Note. On the TT–107B/FG the friction adjusting collar on the function shaft is secured by clamping screws.

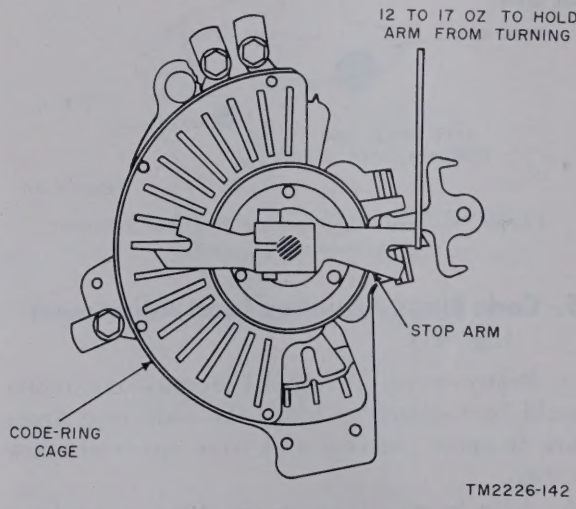


Figure 42. Stop arm torque adjustment.

67. T-Lever Pivot Stud Adjustment

(fig. 43)

a. Requirement. The T-levers should engage the selector Y-levers an equal amount for both mark and space positions of the Y-levers.

b. Method of Checking. With the transfer lever latched and the function shaft in the stopped position, set the No. 1 selector Y-lever in a mark position. Trip the transfer lever by pulling the transfer lever trip latch down, causing the T-levers to engage the Y-levers. Check the amount of engagement by eye. Reposition the transfer lever and the T-levers by rotating the motor by hand. Set the No. 1 Y-lever in a space position, trip the transfer lever, and check the amount of engagement by eye.

c. Adjustment. Loosen the self-locking hexagonal nut on the rear of the T-lever pivot stud. Position the pivot stud until the requirement is met and tighten the self-locking hexagonal nut. Note the normal direction of maximum eccentricity. Check related adjustments (pars. 56 and 70 or 73).

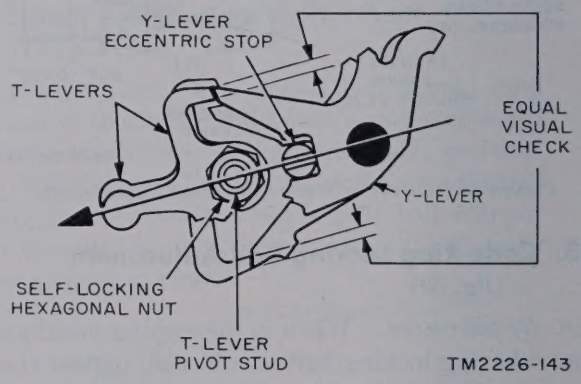


Figure 43. T-lever pivot stud adjustment.

68. Rangefinder Cam and Selector Lever Stop Comb Adjustment (TT–107/FG)

(fig. 44)

a. Requirements.

(1) The selector levers should be centered visually with their corresponding Y-levers.

(2) The rangefinder dial must read 55 to 65 when the rangefinder cam high point is in line with the index mark on the rangefinder and comb bracket.

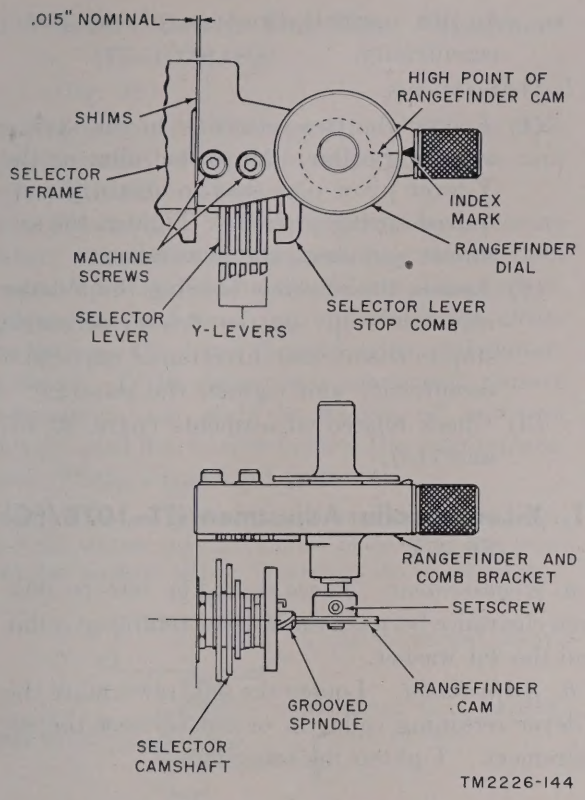


Figure 44. Rangefinder cam and selector lever stop comb adjustment (TT–107/FG).

b. Adjustments.

(1) Loosen the machine screws and position the selector lever stop comb to visually center the selector levers with the Y-levers; tighten the machine screws. If the selector lever stop comb cannot be adjusted to meet the requirement, loosen the machine screws that hold the rangefinder and comb bracket. Add or remove shims to provide the desired clearance. Tighten the machine screws and recheck the clearance.

(2) Loosen the setscrews in the rangefinder cam. Center the rangefinder cam visually with the grooved spindle in the selector camshaft. Set the rangefinder dial at 60 and tighten the knurled nut. Rotate the rangefinder cam until the high point is in line with the index mark; tighten the setscrews.

69. Selector Lever Stop Comb, Rangefinder Cam, and Rangefinder Detent Adjustment (TT–107B/FG)

(fig. 45)

a. Requirements.

(1) The selector levers should be centered visually with their corresponding Y-levers.

(2) The rangefinder dial must indicate 55 to 65 when the rangefinder cam high point is in line with the index mark on the rangefinder bracket.

(3) The detent should be set so that the detent holds the rangefinder dial firmly without excessive tightness.

b. Adjustments.

(1) Loosen the machine screws and position the selector lever stop comb to visually center the selector levers with the Y-levers; tighten the screws. If the selector lever stop comb cannot be adjusted to meet the requirement, loosen the ma-

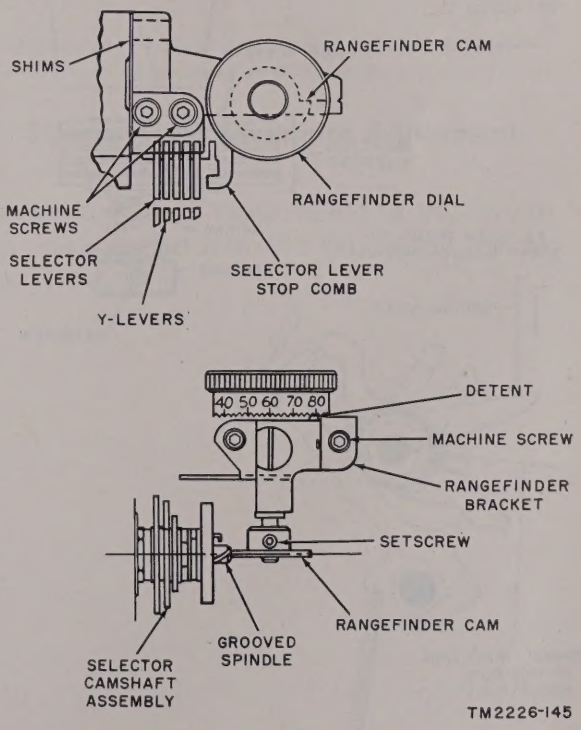


Figure 45. Selector lever comb, rangefinder cam and rangefinder detent adjustment (TT–107B/FG).

chine screws that secure the rangefinder bracket. Add or remove shims to provide the desired clearance.

(2) Loosen the setscrews in the rangefinder cam. Center the rangefinder cam visually with the grooved spindle in the selector camshaft assembly. Set the rangefinder dial at 60. Rotate the rangefinder cam until the high point is in line with the index mark; tighten the setscrews.

(3) Loosen the setscrew holding the detent. Slide the detent against the rangefinder dial to obtain the required detent action. Tighten the setscrew holding the detent.

70. Selector Y-Levers Friction and Eccentric Stop Adjustment (TT–107/FG)

(fig. 46)

a. Requirements.

(1) A push of 40 to 50 grams with a spring scale is required to start each selector Y-lever moving.

(2) The Y-lever eccentric stop should be set in its normal direction of maximum eccentricity.

b. Adjustments.

(1) Loosen the two setscrews in the spring retaining collar. Move the collar on the Y-lever pivot post stud to obtain the required spring pressure. Tighten the setscrews and check the requirement.

(2) Loosen the setscrew holding the Y-lever eccentric stop; set the Y-lever eccentric stop in the normal direction of maximum eccentricity and tighten the setscrew.

(3) Check related adjustments (pars. 56, 67, and 110).

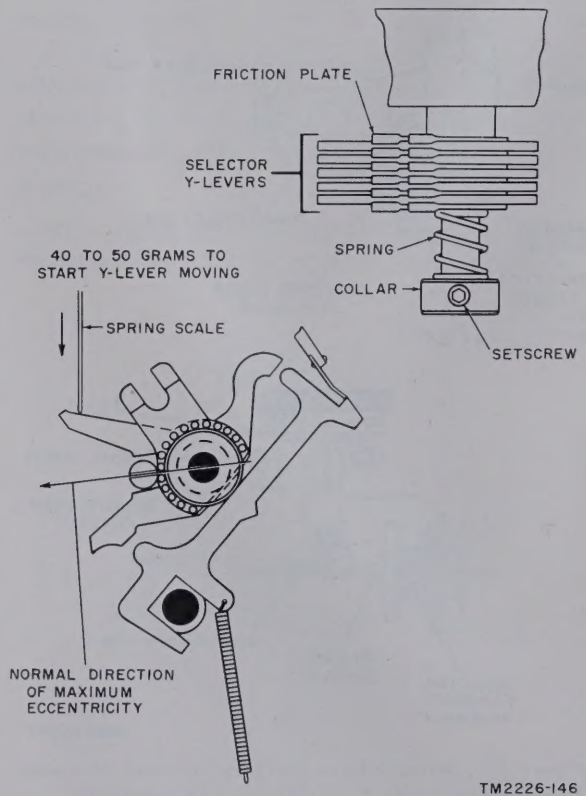


Figure 46. Y-*levers friction adjustment (TT–107/FG).*

71. Y-Levers Collar Adjustment (TT–107B/FG)

(fig. 47)

a. Requirement. There should be .002- to .005-inch clearance between the Y-lever retaining collar and the flat washer.

b. Adjustment. Loosen the setscrews, move the Y-lever retaining collar in or out to meet the requirement. Tighten the setscrews.

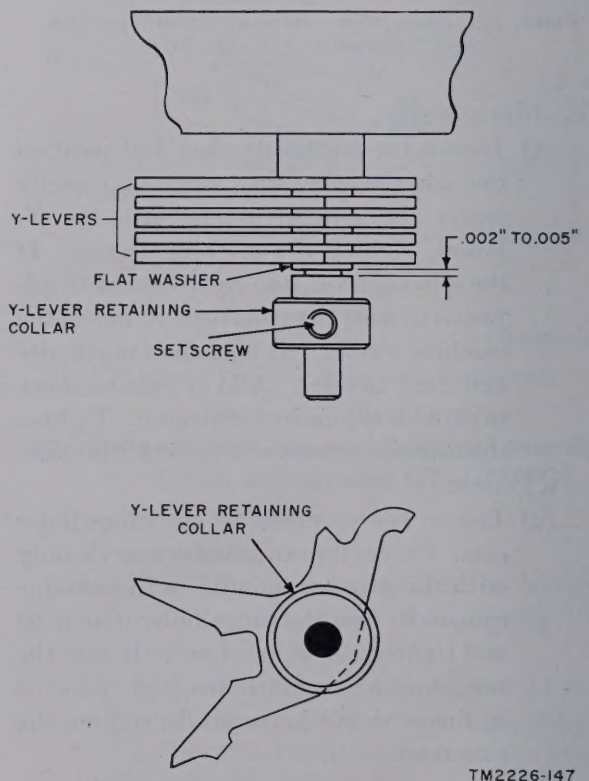


Figure 47. Y-*levers collar adjustment (TT–107B/FG).*

72. Y-Levers Detent End Play Adjustment (TT–107B/FG)

(fig. 48)

a. Requirement. There should be .002- to .005-inch clearance between the centering sleeve and the front thrust washer.

b. Adjustment. Y-lever detents and thrust washers are placed on the centering sleeve, then the stackup is slipped on the Y-lever detent pivot. Tighten the hexagonal nut and check the clearance between the front thrust washer and centering sleeve. If the clearance is not correct, remove the hexagonal nut, slide the stackup off, and peel the laminated flat washer to meet the requirement. Check related adjustment (par. 73).

Note. The one thrust washer adjacent to the laminated flat washer may have to be replaced by five laminated flat washers to help in meeting the requirement.

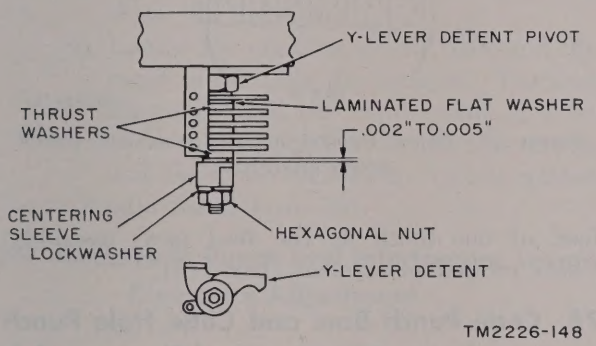


Figure 48. Y-levers detent end play adjustment (TT–107B/FG).

73. Y-Lever Detents and Selector Y-Levers Adjustment (TT–107B/FG)

(fig. 49)

a. Requirement.

(1) The Y-lever eccentric stop should be set in the normal direction of maximum eccentricity.

(2) There should be an equal engagement of each Y-lever detent with each selector Y-lever when the Y-levers are in either the mark or space position.

(3) It should require 30 to 60 grams to start a Y-lever moving.

b. Adjustment.

(1) Loosen the setscrew holding the Y-lever eccentric stop; set the Y-lever eccentric stop in the normal direction of maximum eccentricity and tighten the setscrew.

(2) Loosen the hexagonal nut and turn the centering sleeve until the requirements in *a*(2) and (3) above are met. Tighten the hexagonal nut.

(3) Check related adjustments (pars. 56, 67, and 110).

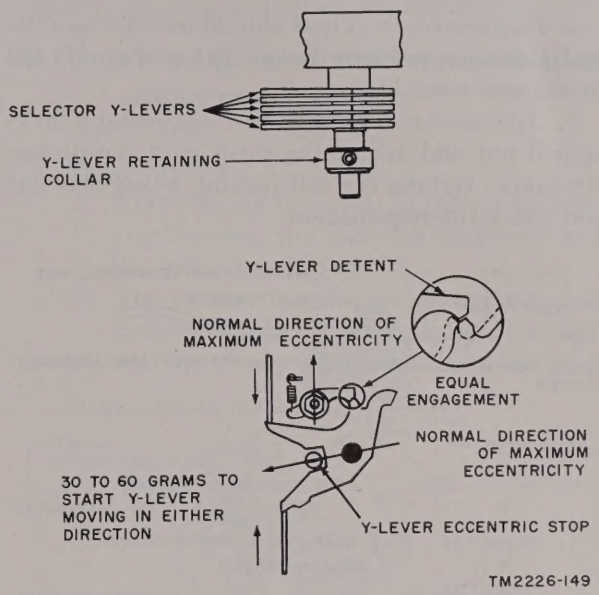


Figure 49. Y-lever detents and selector Y-levers adjustment (TT–107B/FG).

74. Selector Lever Clearance Adjustment

(fig. 50)

a. Requirement. There should be .002- to .005-inch clearance between the flat washer and the first selector lever.

Figure 50. Selector lever clearance adjustment.

b. Adjustment. Loosen the setscrew and slide the selector lever pivot stud in or out to meet the requirement. Tighten the setscrew.

75. Code Hole Punch Levers Clearance Adjustment

(fig. 51)

a. Requirement. There should be .001- to .003-inch clearance between the last flat washer and the punch arm assembly.

b. Adjustment. Loosen the self-locking hexagonal nut and adjust the pivot stud for proper clearance; tighten the self-locking hexagonal nut and check the requirement.

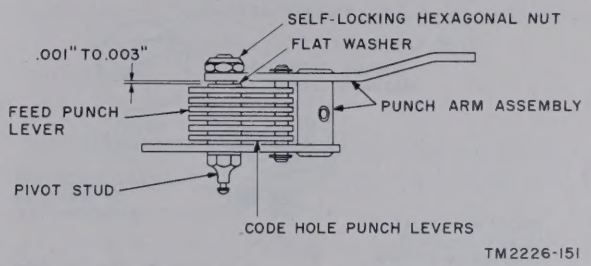


Figure 51. Code hole punch levers clearance adjustment.

76. Punch Interference and Code Hole Punch Levers Alinement

(fig. 52)

a. Requirement. The code hole punch levers and punch interference levers should be alined for equal spacing.

b. Adjustment. Loosen the setscrew in the front support frame and position the punch arm pivot post to meet the requirement. Tighten the setscrew and check the requirement. Check related adjustment (par. 78).

77. Feed Pawl Assembly and Ratchet Shaft Clearance Adjustment

(fig. 53)

a. Requirement. The feed pawl assembly should turn the ratchet shaft one tooth for each operation.

b. Adjustment. Release the transfer lever trip latch and turn the motor by hand until the feed pawl assembly turns the ratchet shaft one tooth. Turn the machine screw in or out so that the feed pawl will just clear the ratchet wheel tooth when the motor is turned by hand to complete the cycle. Check this step to be sure that there is a complete

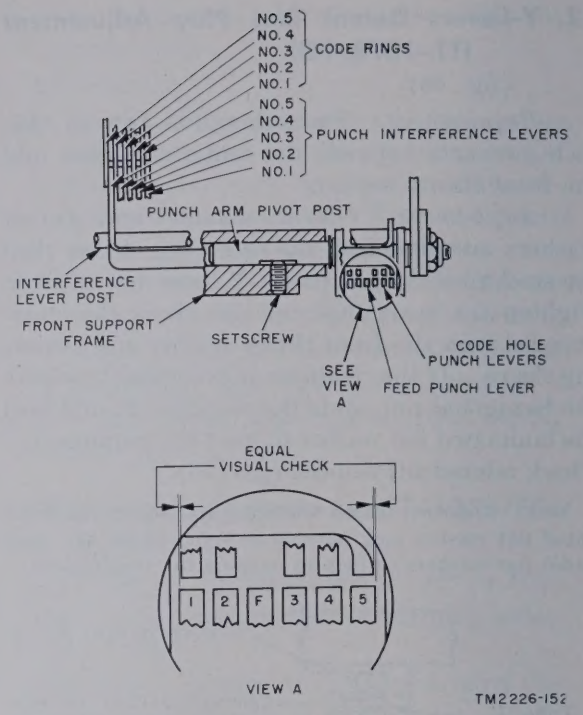


Figure 52. Punch interference and code hole punch levers alinement.

feed of one tooth by the feed pawl assembly. Check related adjustment (par. 119).

78. Code Punch Bars and Code Hole Punch Levers Alinement and Clearance Adjustment

(fig. 54)

a. Requirements.

(1) There should be a .001- to .013-inch clearance between each code hole punch lever and the flat surfaces of its associated code punch bar.

(2) There should be a .001- to .003-inch clearance between the comb and the flat surface of each code punch bar.

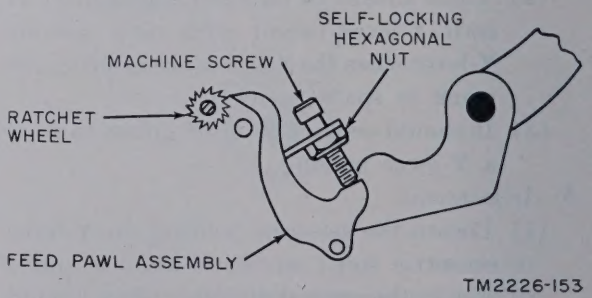


Figure 53. Feed pawl assembly and ratchet shaft clearance adjustment.

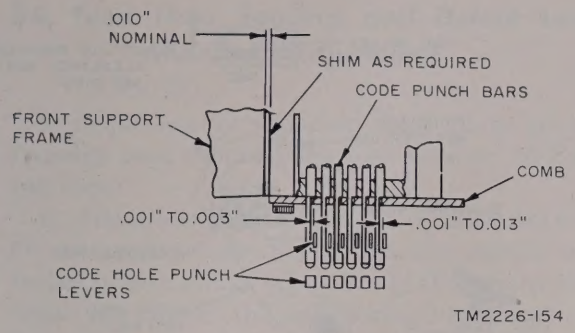


Figure 54. Code punch bars and code hole punch levers alinement and clearance adjustment.

b. Adjustments.

(1) Loosen the machine screws that hold the punch and die assembly to the front support frame. Insert or remove enough shims to meet the requirement in *a*(1) above; tighten the machine screws and check the clearance.

(2) Loosen the machine screws that hold the comb to the code die support. Position the comb until the requirement in *a*(2) above is met; tighten the machine screws and check the clearance. Check related adjustment (par. 76).

79. Code Hole Punch and Interference Levers Clearance Adjustment

(fig. 55)

a. Requirement. When the punch interference levers are in the space position there should be .015- to .025-inch clearance between the first code hole punch lever and its associated punch interference lever.

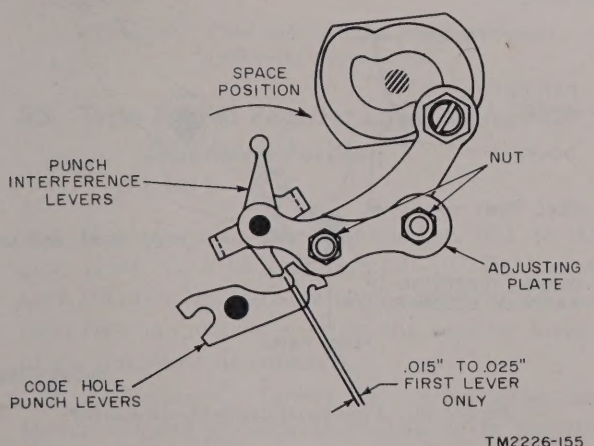


Figure 55. Code hole punch and interference levers clearance adjustment.

b. Method of Checking. Position the selector Y-levers to the space position. Trip transfer lever latch and turn the motor by hand until the code hole punch levers are in the position shown. Check the requirement.

c. Adjustment. Loosen the nuts and position the adjusting plate until the requirement is met. Tighten the nuts and check the clearance.

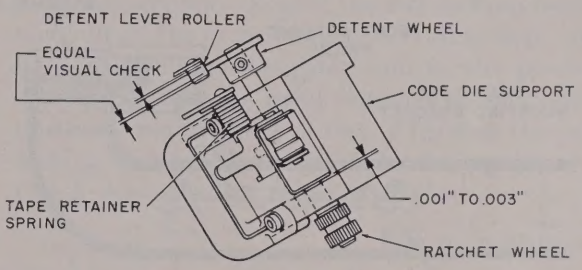
80. Tape Feed Sprocket and Retainer Bracket Adjustments

(fig. 56)

a. Requirements.

(1) There should be a .001- to .003-inch clearance between the tape feed sprocket and the code die support.

(2) The retainer mounting bracket must be mounted as closely as possible to the tape feed sprocket without touching it.



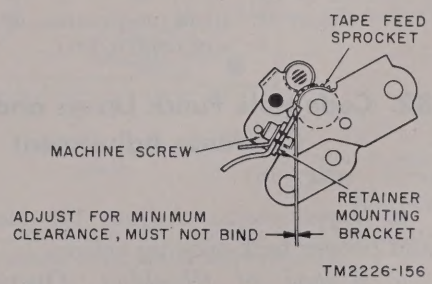


Figure 56. Tape feed sprocket and retainer bracket adjustments.

b. Adjustments.

(1) Loosen the two setscrews in the tape feed sprocket. Position the sprocket until the requirement in *a*(1) above is met. Tighten the setscrews and check the clearance.

(2) Loosen the retainer mounting bracket machine screws. Position the retainer mounting bracket against the tape feed sprocket to meet the requirement in *a*(2)

above. Tighten the machine screws and check the requirement.

(3) Check related adjustment (par. 84).

81. Chad Tube Locating Adjustment (TT–107B/FG)

(fig. 57)

a. Requirement. The chad tube should be centered and bottomed in the grooves of the code die assembly.

b. Adjustment. Loosen the machine screws that hold the chad tube to the front support frame and position the chad tube until the requirement is met. Tighten the machine screws and check the requirement.

Note. Remove the chad tube cover to perform this adjustment. Replace the cover when the chad tube position is correct.

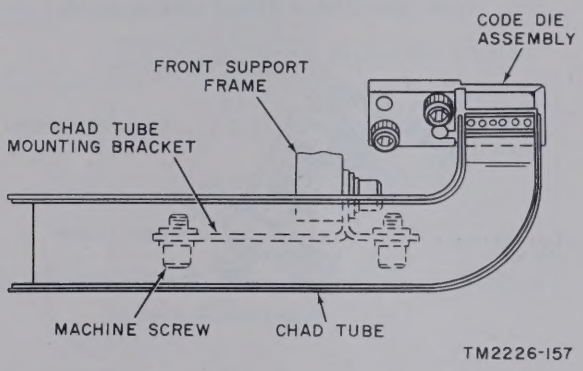


Figure 57. Chad tube locating adjustment (TT–107B/FG).

82. Code Hole Punch Levers and Cam Roller Clearance Adjustment

(fig. 58)

a. Requirement. Adjust for clean punching and proper back-spacing action.

b. Method of Checking. Operate the back space lever. Any burring or elongation of perforated holes indicates code hole punch levers are too high.

c. Adjustment. Loosen the hexagonal nut and adjust the eccentric stud until the requirement is met. The eccentric stud is to be adjusted for minimum clearance between the cam roller and the print and register cam. Tighten the hexagonal nut and check the clearance. Check related adjustments (pars. 83 and 77).

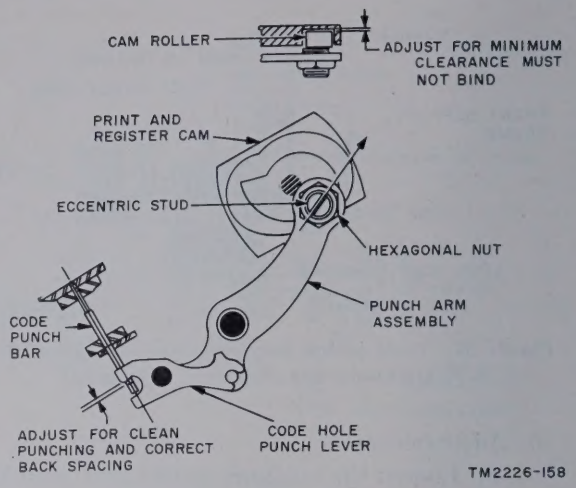


Figure 58. Code hole punch levers and cam roller clearance adjustment.

83. Feed Pawl Assembly Alinement

(fig. 59)

a. Requirement. There should be .010- to .025-inch clearance between the feed pawl assembly and the ratchet wheel when the print and register cam is in the stop position.

b. Adjustment. Loosen the self-locking hexagonal nut on the feed pawl pivot and turn the feed pawl pivot until the requirement is met; tighten the self-locking hexagonal nut and check the clearance. Check related adjustment (par. 77).

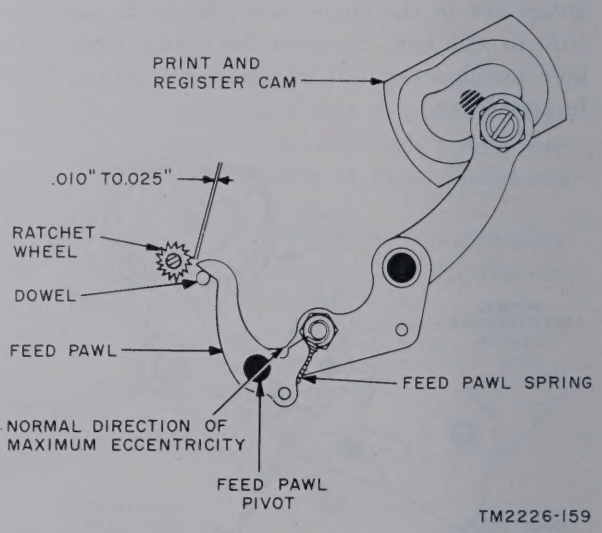


Figure 59. Feed pawl assembly alinement.

84. Feed Hole Spacing and Detent Lever Alinement Adjustment

(fig. 60)

a. Requirement. Punched feed holes in the message tape should be spaced evenly; 10 holes per inch.

b. Adjustment. Measure the distance between 60 consecutive holes. The distance should be 6 inches plus or minus $\frac{1}{64}$ inch. If the requirement is not met, loosen the self-locking hexagonal nut, turning the eccentric stud clockwise to decrease spacing or counterclockwise to increase spacing until the requirement is met. Tighten the self-locking hexagonal nut and check the requirement. Repeat this procedure until the requirement is met. Check related adjustments (pars. 77 and 119).

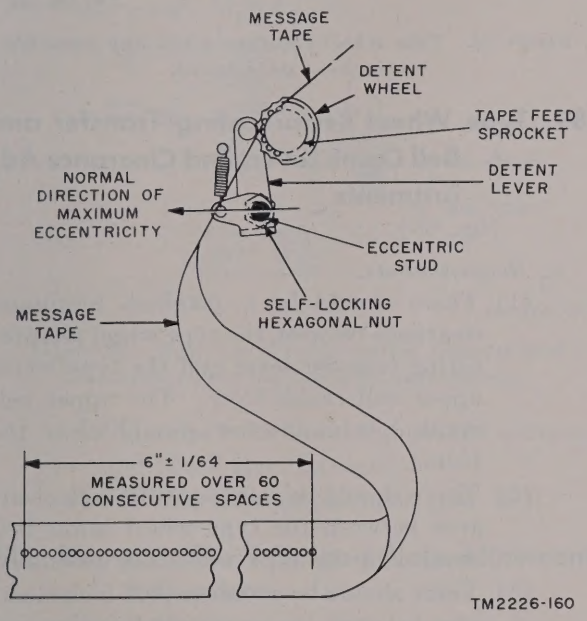


Figure 60. Feed hole spacing and detent lever alinement adjustment.

85. Type Wheel Register Lever Alinement in Operated Position

(fig. 61)

a. Requirement. There should be a .001- to .005-inch (.005- to .015-inch for TT–107/FG) clearance between the register lever eccentric stop and the print hammer lever when the register lever is in the indent of its cam.

b. Adjustment. Loosen the self-locking hexagonal nut and position the register lever eccentric stop until the requirement is met; tighten the self-locking hexagonal nut and check the clearance.

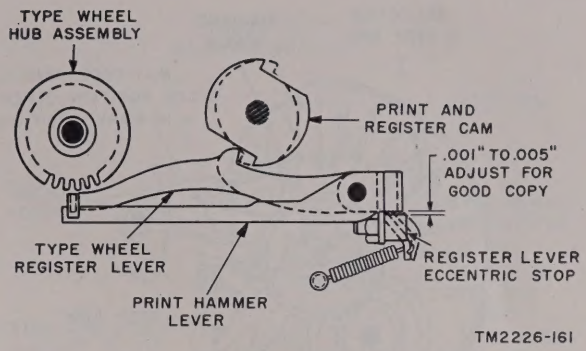


Figure 61. Type wheel register lever alinement in operated position.

86. Print Hammer Lever Alinement in Operated Position (TT–107/FG)

(fig. 62)

a. Requirement. The print hammer eccentric stop should be adjusted to give clear copy.

b. Adjustment. Loosen the self-locking hexagonal nut on the print hammer eccentric stop. Rotate the print and register cam to the position shown. Adjust the print hammer eccentric stop until the requirement is met. Tighten the self-locking hexagonal nut and check the requirement. Check related adjustment (par. 85).

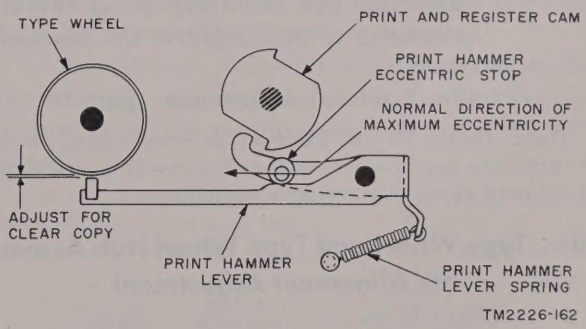


Figure 62. Print hammer lever alinement in operated position adjustment (TT–107/FG).

87. Stop Arm and Type Wheel Hub Assembly Alinement Adjustment

(fig. 63)

a. Requirement. With the stop arm against the left side of the selected V stop bar, the type wheel register lever should engage the fifth notch counterclockwise from the blank portion of the type wheel hub assembly.

b. Adjustment.

(1) Operate the code rings manually. Place the first code ring in the space position and the other four in the mark position.

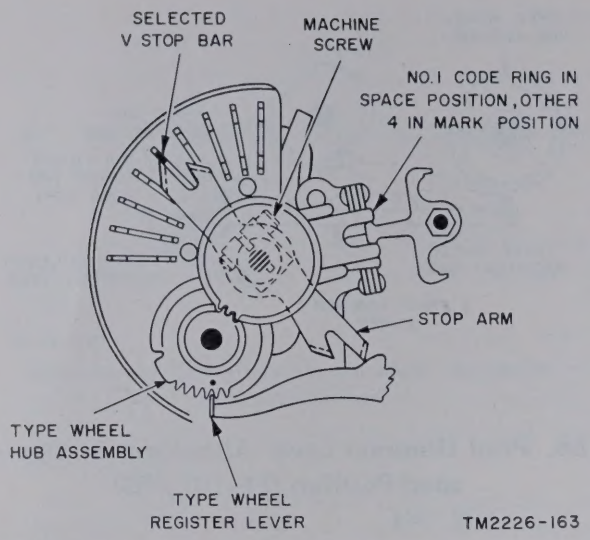


Figure 63. Stop arm and type wheel hub assembly alinement adjustment.

This will allow the V stop bar to be selected.

(2) Loosen the machine screw in the stop arm. Manually turn the type wheel driving gear until the type wheel register lever engages the fifth notch counterclockwise from the blank portion of the type wheel hub assembly. When this requirement is met, tighten the machine screw.

(3) Check related adjustment (par. 88).

Note. On the TT–107/FG the type wheel register lever engages the fourth notch counterclockwise from the blank portion of the type wheel hub assembly.

88. Type Wheel and Type Wheel Hub Assembly Alinement Adjustment

(fig. 64)

a. Requirement. The letter V on the type wheel must be alined with the fifth notch counterclockwise from the blank portion of the type wheel hub assembly.

b. Adjustment. Loosen the machine screws of the type wheel clamp plate mounting disk and turn the type wheel until the requirement is met; tighten the machine screws. The stop arm and type wheel hub assembly must be alined (par. 87) before this adjustment is made.

c. Final Check. All characters must be fully printed.

Note. On the TT–107/FG the letter V is alined with the fourth notch counterclockwise from the blank portion of the type wheel hub assembly.

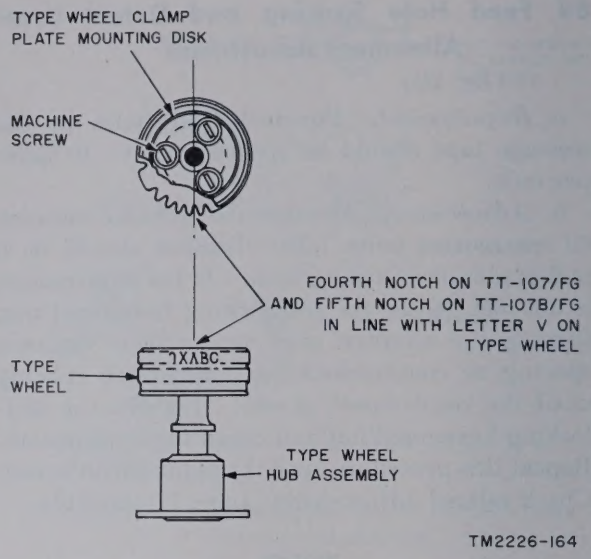


Figure 64. Type wheel and type wheel hub assembly alinement adjustment.

89. Type Wheel Reciprocating Transfer and Bell Crank Levers End Clearance Adjustments

(fig. 65)

a. Requirements.

(1) There should be a .005-inch minimum clearance between the type wheel reciprocating transfer lever and the type wheel upper bell crank lever. The upper bell crank machine screw should clear the frame.

(2) There should be a .005- to .010-inch clearance between the type wheel lower bell crank and the type wheel hub assembly.

(3) There should be a .002- to .005-inch clearance between the upper shaft collar and the frame.

b. Adjustment.

(1) Loosen the machine screw in the type wheel upper bell crank lever and position the lever to give the required clearance; tighten the machine screw and check the clearance.

(2) Loosen the machine screw in the type wheel lower bell crank lever. Adjust for the required clearance between the type wheel lower bell crank lever and the type wheel hub assembly; tighten the machine screw and check the clearance.

(3) Loosen the setscrew in the upper shaft collar and position the shaft collar to give

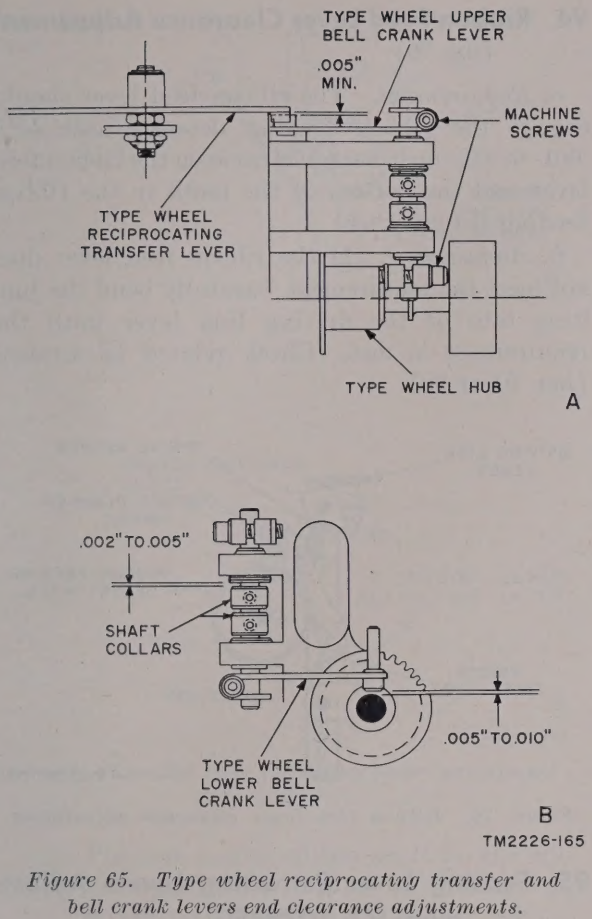


Figure 65. Type wheel reciprocating transfer and bell crank levers end clearance adjustments.

the proper clearance, tighten the setscrew and check the clearance.

(4) Check related adjustment (par. 99).

90. Stop Arm Shaft Support Plate Alinement Adjustment

(fig. 66)

a. Requirement. The stop arm shaft should turn freely in the stop arm shaft support plate.

b. Adjustments. Loosen the stop arm shaft support plate machine screws. Position the stop arm shaft support plate until the requirement is met. Tighten the stop arm shaft support plate machine screws. Check related adjustments (par. 91 or 93).

91. Cam Follower Eccentric Stud Adjustment (TT–107/FG)

(fig. 67)

a. Requirement. When the left side of the ribbon feed cam follower is against the low side of the cam, there should be a .015- to .030-inch clearance between the ribbon reversing arm and the empty spool sensing lever.

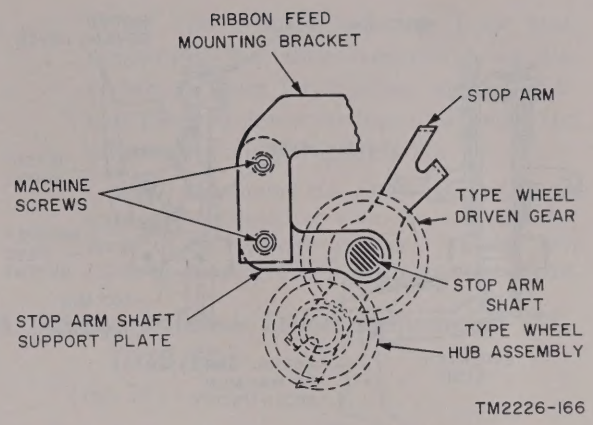


Figure 66. Stop arm shaft support plate alinement adjustment.

b. Adjustment. Adjust the eccentric stud until the requirement is met.

92. Ribbon Feed Detent Adjustment (TT–107B/FG)

(fig. 68)

a. Requirement. The ratchet should have a minimum overtravel of .010 inch when the cam follower is on the high part of the cam.

b. Adjustment. Loosen the setscrew that holds the eccentric and turn the eccentric counterclockwise to meet the requirement. Tighten the setscrew.

Note. The sensing levers should be held out of engagement with the reversing toggle.

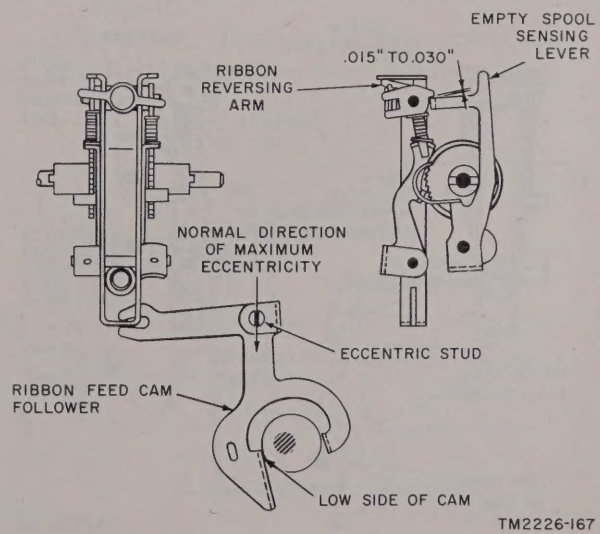


Figure 67. Cam follower eccentric stud adjustment (TT–107/FG).

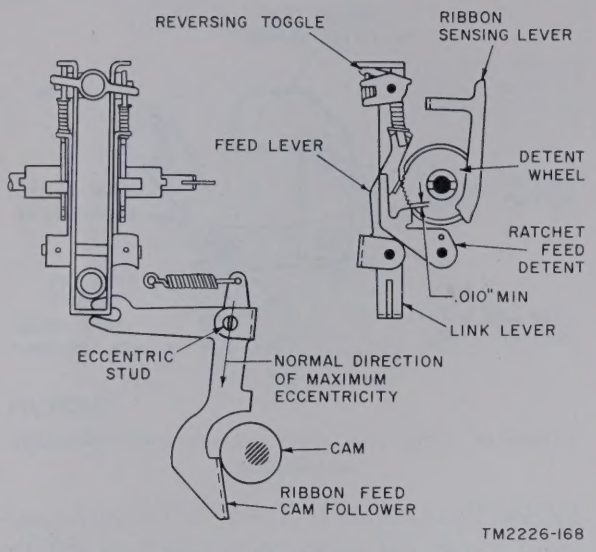


Figure 68. Ribbon feed detent adjustment (TT–107B/FG).

93. Ribbon Feed Reversing Toggle Adjustment (TT–107B/FG)

(fig. 69)

a. Requirement. When the ribbon feed cam follower is against the low side of the cam, there should be not more than .005-inch clearance between the ribbon reversing arm and the empty spool sensing lever.

b. Adjustment. Bend the ear on the empty spool sensing lever to meet the requirement.

Note. The ear should engage the ribbon reversing arm approximately 50 percent of the thickness of the empty spool sensing lever.

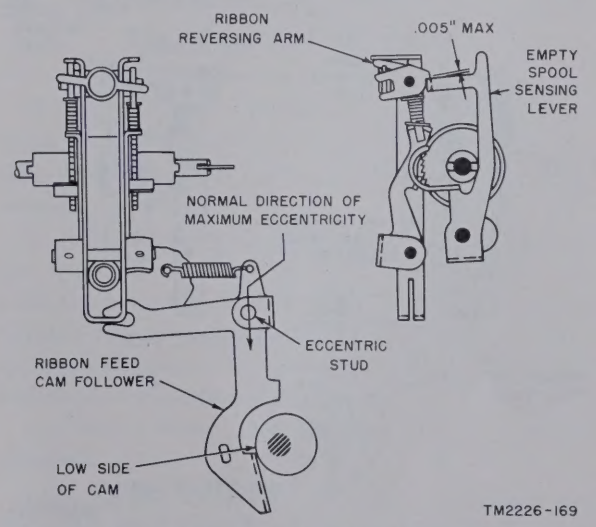


Figure 69. Ribbon feed reversing toggle adjustment (TT–107B/FG).

94. Ribbon Feed Lever Clearance Adjustment

(fig. 70)

a. Requirement. The ribbon feed lever should engage the ribbon feeding detent wheel with .001- to .005-inch clearance between the ribbon feed lever and the bottom of the tooth in the ribbon feeding detent wheel.

b. Adjustment. If the ribbon feed lever does not meet the requirement, carefully bend the limiting tabs of the driving link lever until the requirement is met. Check related adjustment (par. 91 or 92).

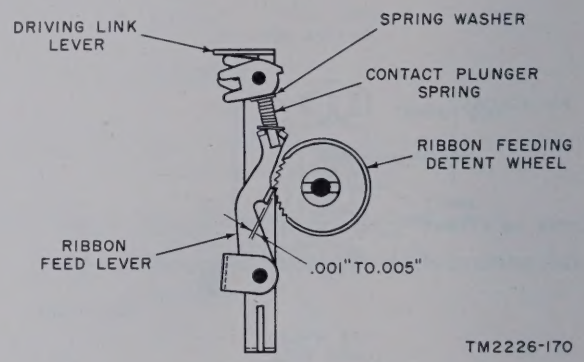


Figure 70. Ribbon feed lever clearance adjustment.

95. Sensing Lever Retracting Levers Adjustment (TT–107B/FG)

(fig. 71)

a. Requirements.

(1) There should be approximately $\frac{1}{16}$-inch clearance between the lower extension of the sensing lever retracting lever and the ribbon feeding detent wheel (A, fig. 71) when the sensing lever is all the way forward against the ribbon feeding detent wheel.

(2) When the ribbon retainer lever is against the hub of the empty spool, the sensing lever must be free to move all the way forward against the ribbon feeding detent wheel. When the ribbon retainer lever is held back, the sensing lever must be retracted sufficiently to allow removal of the empty ribbon spool.

b. Method of Checking.

(1) Remove the ribbon spool. With the sensing lever all the way forward against the ribbon feeding detent wheel, check the clearance visually (a(1) above).

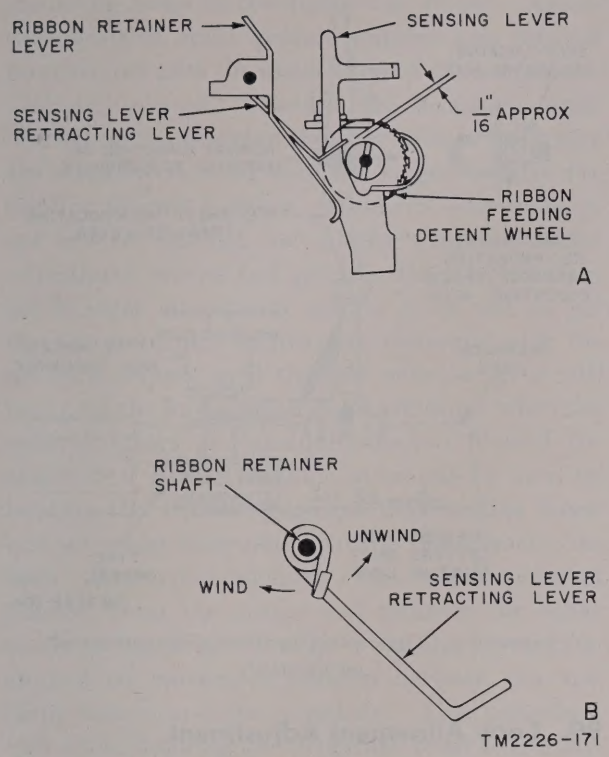


Figure 71. Sensing lever retracting levers adjustment (TT–107B/FG).

(2) Place an empty ribbon spool on the ribbon spool shaft. With the ribbon retainer lever against the empty ribbon spool, check to see that the sensing lever is allowed to move all the way forward against the ribbon feeding detent wheel. Then hold the ribbon retainer lever back and check to see that the sensing lever is retracted sufficiently to allow removal of the empty ribbon spool.

c. Adjustments.

(1) Reform the lower extension of the sensing lever retracting lever (B, fig. 71) to meet the requirement of *a*(1) above.

(2) Remove the ribbon retainer lever, the ribbon retainer lever spring, and the ribbon retainer lever collar. With the sensing lever retracting lever still on the ribbon retainer shaft, wind or unwind the coiled portion of the sensing lever retracting lever until the requirement of *a*(2) above is met. To check the requirement while making the adjustment, place the ribbon retainer lever on the ribbon retainer shaft without the collar. When the requirement has been met, reassemble the ribbon retainer lever, the ribbon retainer lever collar, and the ribbon retainer lever spring, and make the adjustment in paragraph 96.

Note. Unwinding the coiled portion of the sensing lever retracting lever, causes the sensing lever to be retracted farther. Winding will allow the sensing lever to move farther forward.

96. Ribbon Retainer Levers Adjustment (TT–107B/FG)

(fig. 72)

a. Requirement.

(1) The ribbon retainer levers should be positioned so there is a slight clearance between the ribbon retainer levers and the inside of the ribbon spool when the ribbon spool is in full engagement with the ribbon feeding detent wheel.

(2) The ribbon retainer levers should prevent the ribbon spools from becoming disengaged from the ribbon feeding detent wheels.

b. Method of Checking.

(1) Visually check for clearance.

(2) Unlock the ribbon spool clips and pull outward on the ribbon spool. When the outward motion of the spool is stopped by the ribbon retainer lever, check for the requirement by turning the ribbon spool. The spool should not turn unless the ribbon feeding detent wheel turns with it.

c. Adjustment. Loosen the two setscrews in each of the ribbon retainer lever collars and posi-

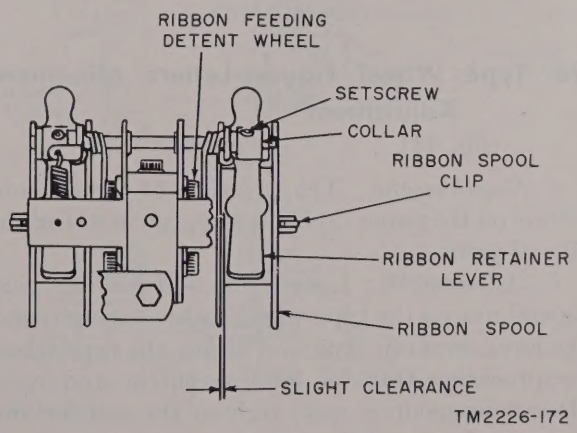


Figure 72. Ribbon retainer levers adjustment (TT–107B/FG).

tion the retainer levers to meet the requirements. Tighten the setscrews and check the requirements.

Note. After this adjustment has been made, it is necessary to check paragraph 97 to make sure the sensing levers move all the way forward under the ribbon reversing arms.

97. Empty Spool Sensing Levers Adjustment (TT–107B/FG)

(fig. 73)

a. Requirement. The empty spool sensing levers must move forward through the hole in the empty ribbon spools.

b. Method of Checking. Place an empty ribbon spool on the ribbon spool shaft, make sure the spool is all the way on. Lock the spool on with the ribbon spool clip. Rotate the spool slowly. The sensing lever should move forward approximately in the center of the hole in the empty ribbon spool. Check both sensing levers in this manner.

c. Adjustment. Remove the empty ribbon spool and bend the lower extension of the empty spool sensing lever to the right or left to meet the requirement. Adjust both sensing levers in this manner.

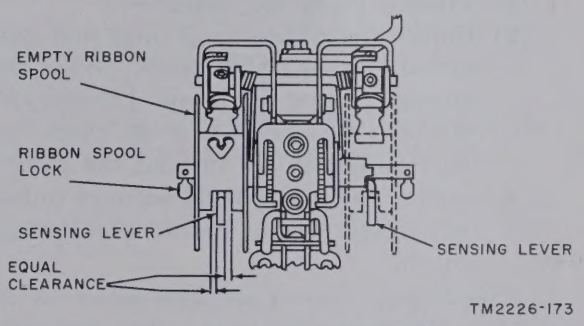


Figure 73. Empty spool sensing levers adjustment (TT–107B/FG).

98. Type Wheel Figures-Letters Alinement Adjustment

(fig. 74)

a. Requirement. The printing of figures and letters on the paper tape must appear in a straight line of print.

b. Adjustment. Loosen the self-locking hexagonal nut on the type wheel reciprocating transfer lever eccentric stud and adjust the type wheel reciprocating transfer lever eccentric stud until the requirement is met; tighten the self-locking hexagonal nut and check the requirements. Check related adjustment (par. 99).

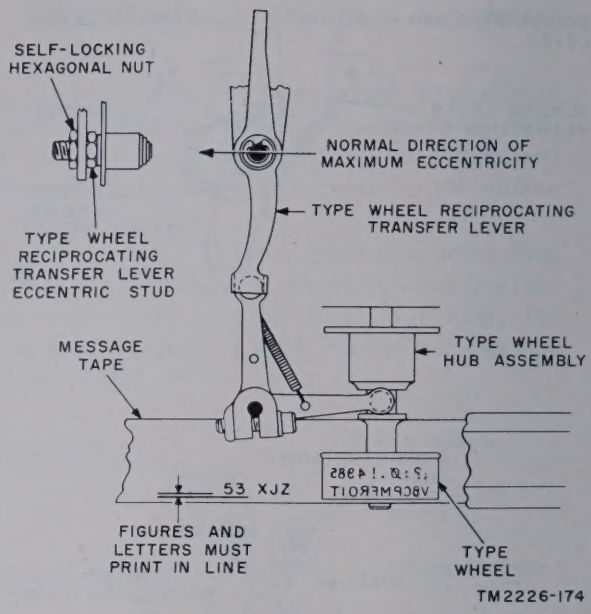


Figure 74. Type wheel figures-letters alinement adjustment.

99. Copy Alinement Adjustment

a. Requirement. The copy should be equally spaced between the first line of the punched code holes and the edge of the paper tape.

b. Adjustment. Loosen the machine screw in the type wheel lower bell crank lever and adjust the type wheel lower bell crank lever until the requirement is met; tighten the machine screw. Check related adjustment (par. 89).

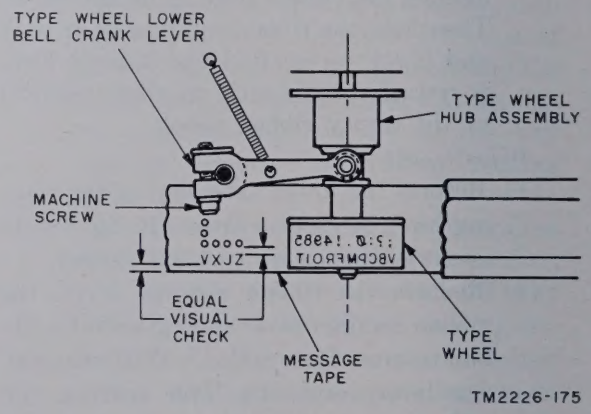


Figure 75. Copy alinement adjustment.

100. Selector-Magnet Bracket and Armature Alinement Adjustment

a. Requirement. The selector-magnet bracket must be positioned on the frame so that the larger holes in the selector-magnet bracket and the

mounting holes in the frame are alined. Armature position must permit number one selector lever to just pass the knife edge of the armature.

b. Adjustment. Position the selector-magnet bracket on the frame so that the holes in the frame are visually centered with the larger holes in the selector magnet bracket. Hold the selector-magnet bracket against the selector-magnet bracket adjustment screws and position the selector-magnet bracket adjustment screws in or out to get the requirement. Adjust the armature with the machine screws until the first selector lever will just pass the knife edge of the armature when the selector levers are manually moved toward the armature. Either machine screw can be used by holding the armature against the machine screw and screwing in or out until the requirement has been obtained. Remove the selector-magnet bracket from the frame and position the other machine screw until only a barely perceptible amount of movement remains between the machine screws and the armature. This procedure will avoid bending the armature from overtightening a machine screw. Check related adjustment (par. 102 or 103).

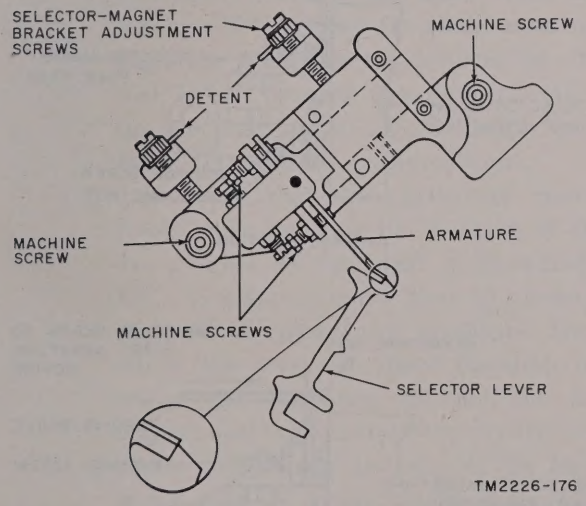


Figure 76. Selector-magnet bracket and armature alinement adjustment.

101. Bar Magnet Preliminary Clearance Adjustment

(fig. 77)

a. Requirement. There should be a clearance of .015-inch between the south pole of the bar magnet and the armature stop bracket.

b. Adjustment. Assemble the bar magnet on the selector-magnet bracket so that the requirement is met. Tighten the setscrew. Check related adjustment (par. 102 or 103).

Note: The north pole of the bar magnet is designated by a red dot on the side of the bar magnet.

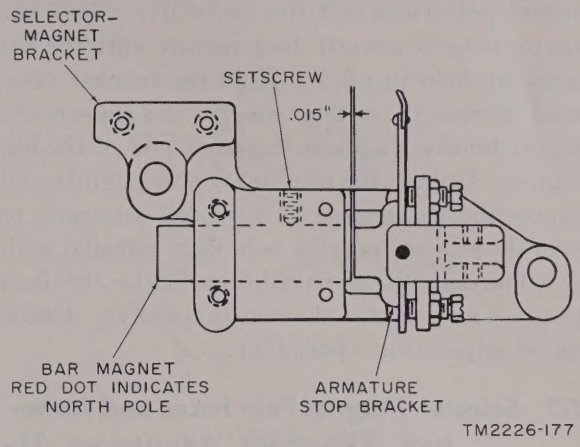


Figure 77. Bar magnet preliminary clearance adjustment.

102. Selector-Magnet Pole Faces and Armature Alinement Adjustment (TT–107/FG)

(fig. 78)

a. Requirement. The selector magnet pole faces should be parallel with the armature and there should be .008-inch clearance between both selector magnet pole faces and the armature with the armature in the fixed position (as a result of the adjustment in paragraph 100).

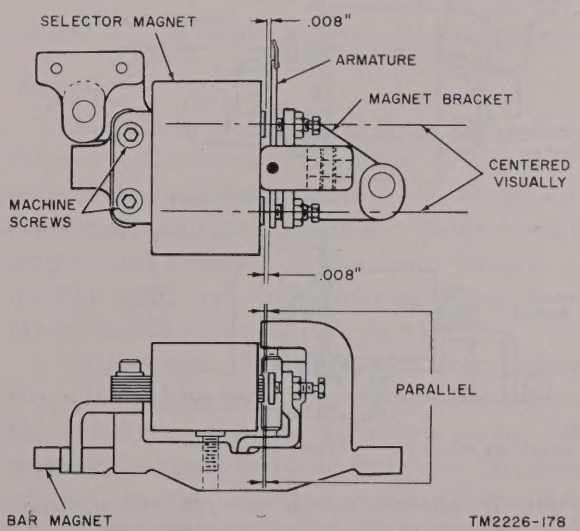


Figure 78. Selector magnet pole faces and armature alinement adjustment (TT–107/FG).

b. Adjustment. The selector magnet is fastened to the selector-magnet bracket by two machine screws. Loosen the two machine screws slightly. This allows the selector magnet to be moved toward or away from the armature. Place .008-inch flat gages (brass, if possible) between the selector magnet pole faces and the armature. Move the selector magnet toward the armature until the flat gages are held in place. Hold the bracket (fastened between the selector magnet and the selector magnet bracket) against the north end of the bar magnet. Tighten the machine screws slightly and remove the flat gages. Adjust the setscrews to make the selector magnet pole faces parallel with the armature. When parallel, check the .008-inch clearance and tighten the machine screws. Check related adjustment (par. 104).

103. Selector-Magnet Pole Faces and Armature Alinement Adjustment TT–107B/FG)

(fig. 79)

a. Requirement. There should be a gap of .004-inch between the pole faces of the selector magnet core and the toffets on the armature.

b. Adjustment. Mount the magnet bracket and the selector magnet on the selector magnet bracket by the machine screw and selector magnet cable stud. Insert a .004-inch gage between each pole face and armature toffet. Make sure the .004-inch clearances are equal and that the surfaces on the armature toffets and the pole faces are parallel to each other within .002 inch. Use the setscrews located underneath the selector magnet to adjust to the latter requirement. Remove the lock setscrews and position the adjusting setscrews in or out to meet the requirement. Replace the lock setscrews. Back out the armature adjusting screw so that the armature in either the mark of space position does not touch the adjusting screws. Check related adjustment (par. 105).

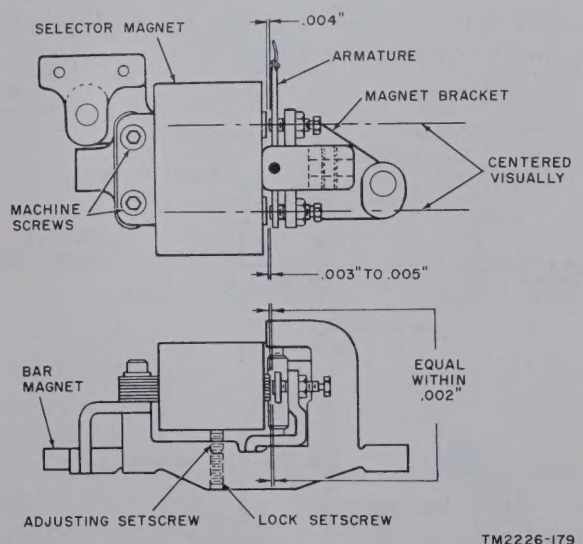


Figure 79. Selector magnet pole face and armature alinement adjustment (TT–107B/FG).

104. Armature Machine Screws Final Adjustment and Bar Magnet Attractive Force (TT–107/FG)

(fig. 80)

Note. Perform adjustments in paragraphs 100, 101, and 102 before making this adjustment.

a. Requirements.

(1) There should be a .004-inch clearance between the selector-magnet pole faces

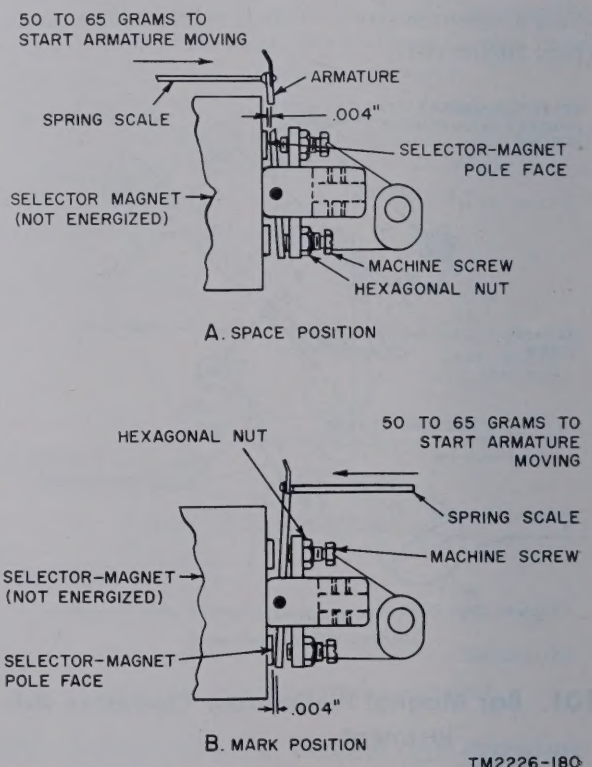


Figure 80. Armature machine screws final adjustment and bar magnet attractive force (TT–107/FG).

and the armature (A, fig. 80) when the opposite end of the armature is against its machine screw.

(2) A force of 50 to 65 grams should be required to start the armature moving from either the mark or space position when the selector-magnet bracket is removed from the machine and the signal and bias current are removed and the two armature leaf spring stop screws are away from the leaf springs of the armature.

b. Method of Checking.

(1) With the armature held in the space position (A, fig. 80), there should be .004-inch clearance between the armature and the selector magnet pole face. With the armature in the mark position (B, fig. 80), there should be .004-inch clearance between the selector magnet pole face and the armature.

(2) Use a spring scale to measure the 50 to 65 grams required to move the armature from mark to space position.

c. Adjustments.

(1) Loosen the hexagonal nuts on the armature machine screws and slowly back one machine screw away from the armature until the clearance requirement of .004 inch is met between the opposite end of the armature and its selector magnet pole face. Tighten the hexagonal nut.

(2) Determine that the armature moves freely, then readjust the position of the bar magnet as described in paragraph 101. If a force greater than 65 grams is required to move the armature from either the mark or space position, increase the clearance between the bar magnet and the armture stop bracket until the requirement is met. If the force is less than 50 grams, decrease the bar-magnet clearance. When the attractive force requirement is met, check the adjustment specifications described in paragraphs 100 and 102 and the requirement in *a*(1) above. If the requirements cannot be met after this adjustment, replace the bar magnet. Check related adjustment (par. 106).

105. Bar Magnet Attractive Force and Armature Clearance Adjustment (TT–107B/FG)

(fig. 81)

a. Requirement. A pull from 40 to 75 grams should be exerted by the permanent magnet on the armature.

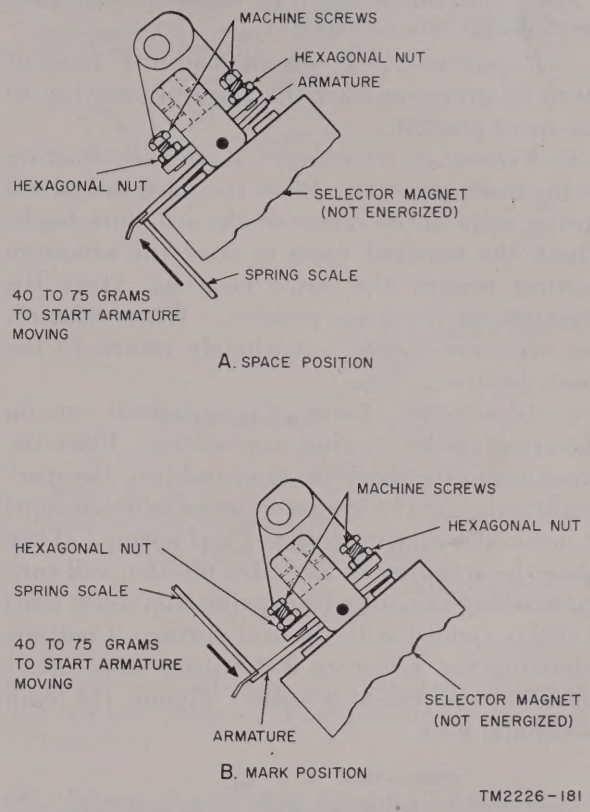


Figure 81. Bar magnet attractive force and armature clearance adjustment (TT–107B/FG).

b. Method of Checking. With the selector-magnet coil not energized, use a spring scale to measure the pull required to start the armature blade moving in each direction. Pull toward the magnet coil assembly in the space position (A, fig. 81), pull away from the magnet coil assembly in the mark position (B, fig. 81).

c. Adjustment. Place .004-inch feeler gages between the pole faces of the core and the toffets on the armature. Set the adjusting screws back down on the armature blade, make sure that screws are not too tight or they will bend the blade. Loosen the selector magnet coil mounting screws and bar magnet setscrew. Close or open the gap

at the south pole of the bar magnet to obtain the requirement. Perform the adjustment as outlined in paragraphs 107 and 108 and check the requirement in *a* above.

106. Armature Leaf Spring Adjustment (TT–107/FG)

(fig. 82)

Note. This adjustment to be completed after paragraph 104 has been completed.

a. Requirement. It should require a force of 30 to 50 grams to start the armature moving to the space position.

b. Method of Checking. Move the armature to the mark position. Place the push end of the spring scale in the center of the armature blade. Check the required force to start the armature moving toward the space position. Hold the armature in the space position. When released, the armature should immediately return to the mark position.

c. Adjustment. Loosen the hexagonal nuts on the armature leaf spring stop screws. Place the armature in the mark position and turn the spacing armature leaf spring stop screw in or out until it just makes contact with the leaf spring. Then place the armature in the space position and turn the marking armature leaf spring stop screw until it makes contact with the leaf spring. Continue adjusting the armature leaf spring stop screws until the requirement is made. Tighten the plain hexagonal nuts.

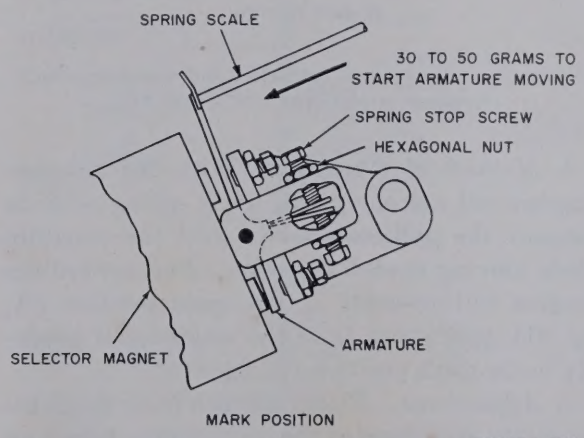


Figure 82. Armature leaf spring adjustment (TT–107/FG).

107. Selector-magnet Attractive Force and Leaf Spring Adjustment (TT–107B/FG)

(fig. 83)

a. Requirement. The pressure required to move the armature to the mark or space positions when the selector magnet is deenergized should be within 10 grams of each other, and both should fall between 10 and 35 grams.

b. Method of Checking. The magnet assembly should be mounted to the selector casting. Use the spring scale against the armature blade.

c. Adjustment. Position the armature leaf spring stop screws until the requirement is met.

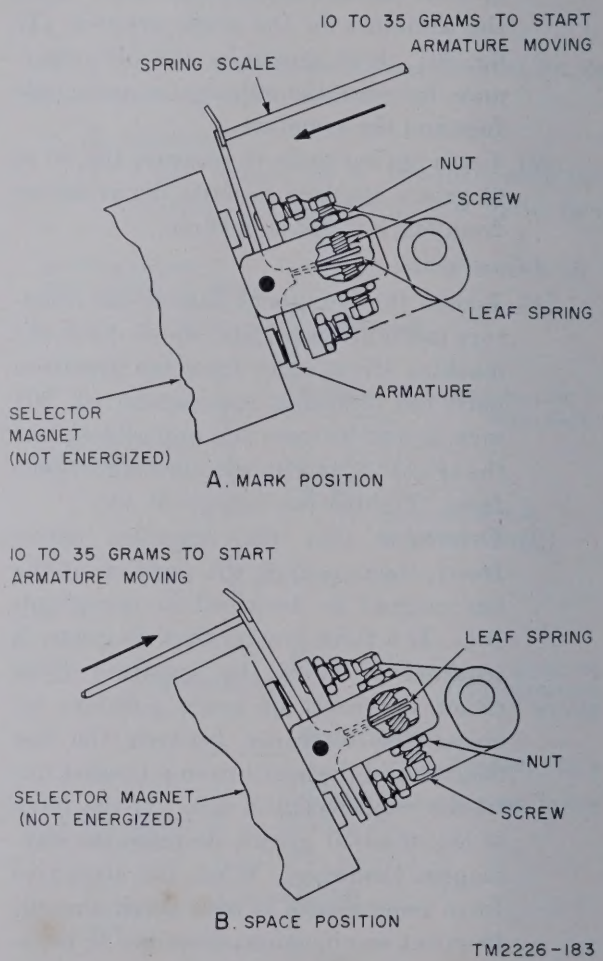


Figure 83. Selector-magnet attractive force and leaf spring adjustment (TT–107B/FG).

108. Selector Lever and Armature Alinement and Selector Camshaft Lever Eccentric Adjustment (TT–107/FG)

(fig. 84)

a. Requirements.

(1) With the armature in its midtravel position, the armature blade should contact the selector levers (A, fig. 84).

(2) There should be .002-inch engagement between the armature and the selector camshaft locking lever (B, fig. 84) when the armature is in its midtravel position.

b. Method of Checking.

(1) Place .008-inch feeler gages between the selector magnet pole faces and the armature. Manually move the selector levers toward the armature and check the requirement visually.

(2) Place .008-inch feeler gages between the selector magnet pole faces and the armature. Manually move the selector camshaft locking lever toward the armature and check the requirement visually.

c. Adjustments.

(1) Set the armature in the midtravel position by inserting .008-inch feeler gages between the armature and the selector magnet pole faces.

(2) Loosen the selector-magnet bracket machine screws, leaving them tight enough to set firm tension against the selector-magnet bracket.

(3) Turn the right hand selector-magnet bracket adjusting screw clockwise, rotating the selector-magnet bracket clockwise about its pivot pin, until the first selector lever just touches the armature. Tighten the selector-magnet bracket machine screws.

(4) Loosen the self-locking hexagonal nut that holds the selector camshaft lever eccentric. Place .008-inch feeler gages between the armature and the selector-magnet pole faces. Manually move the selector camshaft locking lever toward the armature and turn the selector camshaft lever eccentric clockwise to counter-clockwise until the requirement is met. Tighten the self-locking hexagonal nut. Check related adjustment (par. 110).

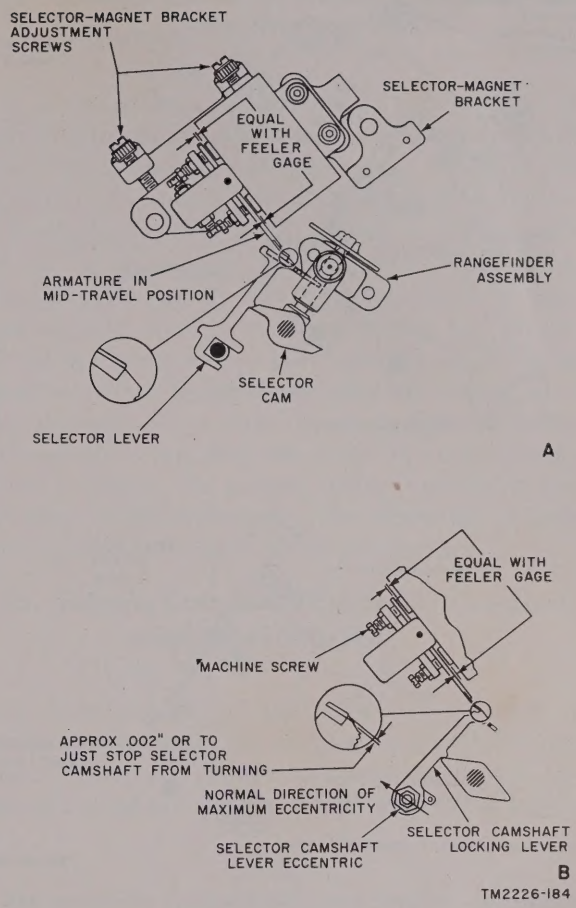


Figure 84. Selector lever and armature alinement and selector camshaft lever eccentric adjustment (TT–107/FG).

109. Selector Lever and Armature Alinement and Selector Camshaft Lever Eccentric Adjustment (TT–107B/FG)

(fig. 85)

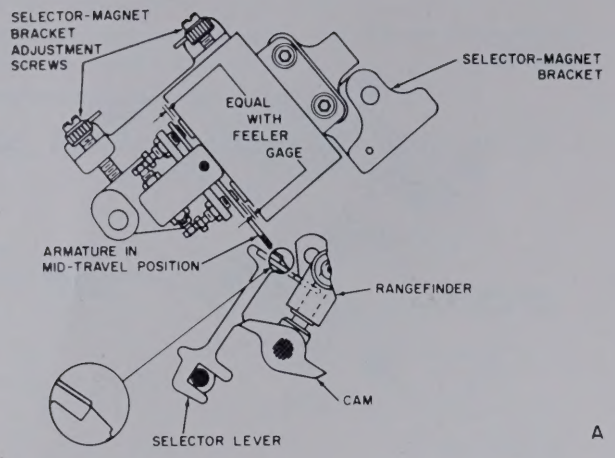
a. Requirements.

(1) With the armature in its midtravel position, the armature blade should just contact the selector levers (A, fig. 85).

(2) There should be .002-inch engagement between the armature and the selector camshaft locking lever (B, fig. 85) when the armature is in its midtravel position.

b. Method of Checking.

(1) Place .004-inch feeler gages between the selector-magnet pole faces and the armature. Manually move the selector levers toward the armature and check the requirement visually.



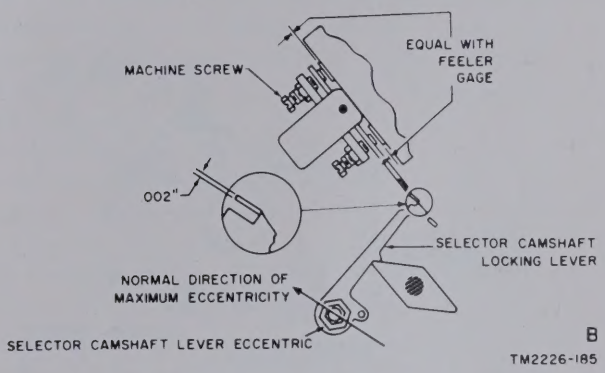


Figure 85. Selector lever and armature alinement and selector camshaft lever eccentric adjustment (TT–107B/FG).

(2) Place .004-inch feeler gages between the selector-magnet pole faces and the armature. Manually move the selector camshaft locking lever toward the armature and check the requirement visually.

c. Adjustments.

(1) Set the armature in the midtravel position by inserting .004-inch feeler gages between the armature and the selector magnet pole faces.

(2) Loosen the selector-magnet bracket machine screws, leaving them tight enough to set firm tension against the selector-magnet bracket.

(3) Turn the right hand selector-magnet bracket adjusting screw clockwise, rotating the selector-magnet bracket clockwise about its pivot pin, until the first selector lever just touches the armature. Tighten the selector-magnet bracket machine screws.

(4) Loosen the self-locking hexagonal nut that holds the selector camshaft lever eccentric. Place .004-inch feeler gages between the armature and the selector-magnet pole faces. Manually move the selector camshaft locking lever toward the armature and turn the selector camshaft lever eccentric clockwise or counterclockwise until the requirement is met. Tighten the self-locking hexagonal nut. Check related adjustment (par. 110).

110. Selector-Magnet Bracket Final Adjustment

(fig. 86)

Note. This adjustment is to be made after the adjustment in paragraph 109 has been completed.

a. Requirement. The selector camshaft should not rotate with a .006-inch feeler gage between the selector Y-lever and the bottom of the Y-lever eccentric stop when the letters code group is received by the selector mechanism and the motor is running. The selector camshaft should rotate when a .002-inch feeler gage is inserted at that position.

b. Adjustment. Adjust the selector-magnet bracket adjustment screws until the above requirement is met. Check related adjustment (pars. 108 or 109 and 111).

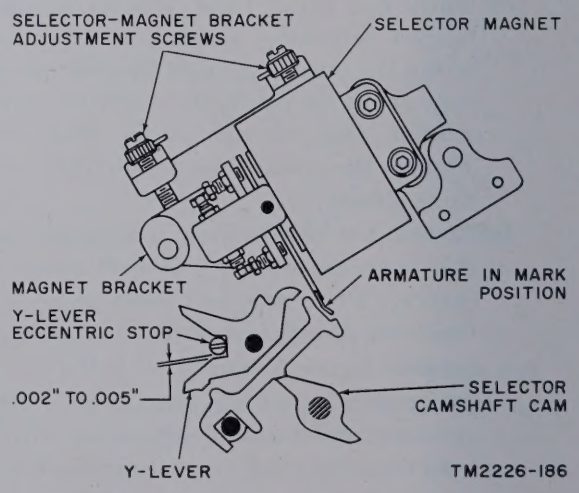


Figure 86. Selector-magnet bracket final adjustment (TT–107/FG).

111. Selector-Magnet Armature Blade and Selector Lever Clearance

(fig. 87)

a. Requirement. The gap between the armature blade and the selector levers should be between .015 and .020 inch.

b. Adjustment. Position the selector lever comb bracket vertically so the requirement is met.

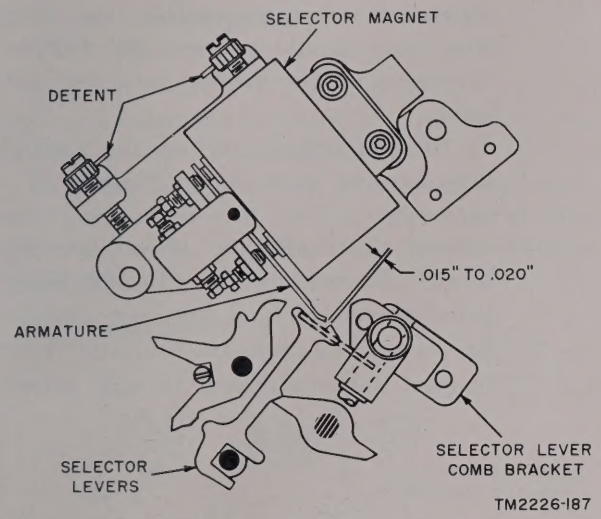


Figure 87. Selector-magnet armature blade and selector lever clearance.

112. Selector Camshaft Friction Clutch Adjustment (TT–107/FG)

(A, fig. 88)

a. Requirement. A pull of 44 to 48 ounces is required to prevent the selector camshaft friction clutch from turning when the motor is on and the selector cams are not operating any selector levers.

b. Method of Checking. Hook a spring scale on the lug on the selector camshaft. While holding the scale rigidly allow the camshaft to turn just slightly until it is not operating any levers. When the free spot has been established, hold the camshaft from turning and read the scale.

c. Adjustment. Loosen the two setscrews in the drive shaft collar, shift the collar forward or backward to obtain the proper spring tension on the friction clutch, and tighten the setscrews. Check the requirement and readjust if necessary.

113. Selector Camshaft Friction Clutch Adjustment (TT–107B/FG)

(B, fig. 88)

a. Requirement. A pull of 44 to 48 ounces is required to prevent the selector camshaft friction clutch from turning when the motor is on and the selector cams are not operating any selector levers.

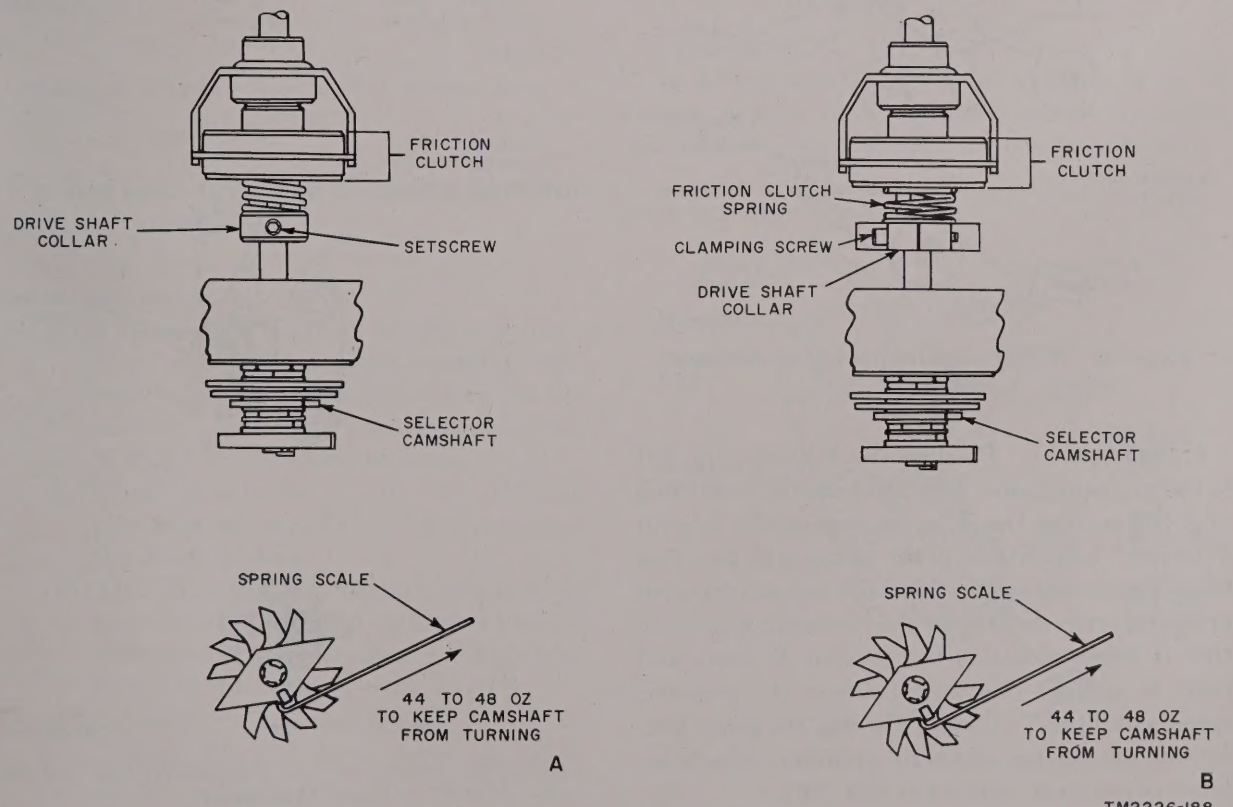


Figure 88. Selector camshaft friction clutch adjustment.

b. Method of Checking. Hook a spring scale on the lug on the selector camshaft. While holding the scale rigidly, allow the camshaft to turn just slightly until it is not operating any levers. When the free spot has been established, hold the camshaft from turning and read the scale.

c. Adjustment. Loosen the two clamping screws in the drive shaft collar, rotate the collar forward or backward to obtain the proper spring tension on the friction clutch, and tighten the clamping screws. Check the requirement and readjust if necessary.

114. Y-Lever Eccentric Spindle Preliminary Adjustment

(fig. 89)

a. Requirement. With the machine in the transferred position, there should be a slight clearance between the **T**-levers and the eccentric spindle.

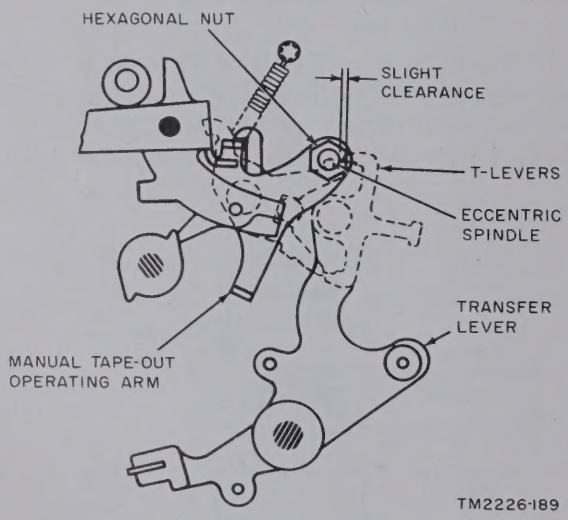


Figure 89. Y-lever eccentric spindle preliminary adjustment.

b. Adjustment. Position the **Y**-levers (fig. 90) to the space position. Trip the transfer lever latch (fig. 89) so that the **T**-levers engage the selector **Y**-levers. Loosen the plain hexagonal nut that holds the eccentric spindle to the manual tape-out operating arm and adjust the eccentric spindle so that it barely contacts the selector **Y**-levers and there is a slight clearance between the eccentric spindle and the **T**-levers. Tighten the plain hexagonal nut on the eccentric spindle. Check related adjustment (pars. 115 and 116).

115. Limit Stop Lever and Manual Tape Feed-Out Lever Adjustment

(fig. 90)

a. Requirement.

(1) There should be .010- to .015-inch clearance between the limit stop lever and the flat washer.

(2) With the eccentric spindle holding the selector **Y**-levers in position, the limit stop lever should prevent any further movement of the manual tape feed-out lever.

(3) In the unoperated position, the manual tape feed-out lever should be vertical.

b. Adjustments.

(1) Loosen the limit stop lever clamping screw. Place a .010- to .015-inch feeler gage between the limit stop lever and the flat washer and rotate the limit stop lever to meet the requirement in *a*(2) above.

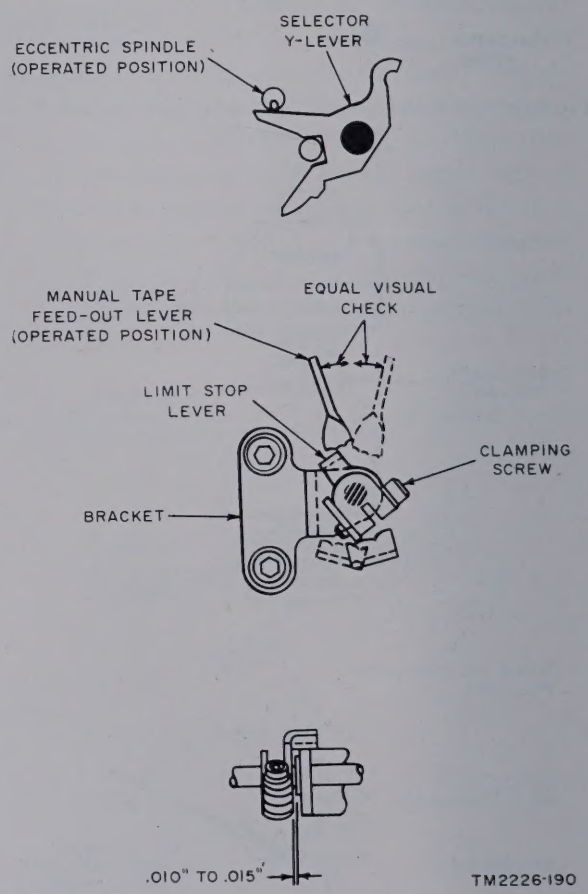


Figure 90. Limit stop lever and manual tape feed-out lever adjustment.

Tighten the limit stop lever clamping screw.

(2) Loosen the manual tape-feed-out lever camping screw and position the manual tape feed-out lever to meet the requirement in *a*(3) above. Tighten the manual tape feed-out lever clamping screw.

116. Manual Tape Feed-Out Latching Lever Adjustment

(fig. 91)

a. Requirement. There should be a .010- to .020-inch clearance between the tape feed-out operating arm and the disabling latch.

b. Adjustment. Loosen the self-locking hexagonal nut and turn the setscrew in or out to meet the requirement. Tighten the self-locking hexagonal nut and check the clearance.

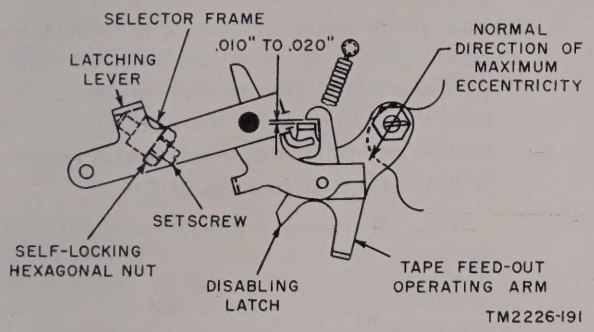


Figure 91. Manual tape feed-out latching lever adjustment.

117. Trip Latch Lever and Disabling Cam Adjustments

(fig. 92)

a. Requirements.

(1) There should be a .020- to .030-inch clearance between the transfer lever trip latch and the transfer lever assembly when the eccentric spindle is holding the selector Y-levers in the space position.

(2) There should be a .002- to .005-inch clearance between the trip latch lever and the bearing sleeve.

(3) The disabling cam should be alined in contact with the disabling latch when the first selector lever is against a high portion of the first selector cam.

b. Adjustments.

(1) Loosen the trip latch lever clamping screw. Position the trip latch lever until requirements *a*(1) and (2) above are met. Tighten the trip latch lever clamping screw and check both requirements.

(2) Loosen the setscrews of the disabling cam and aline the cam until the requirement in *a*(3) above is met. Tighten the setscrew and check the alinement.

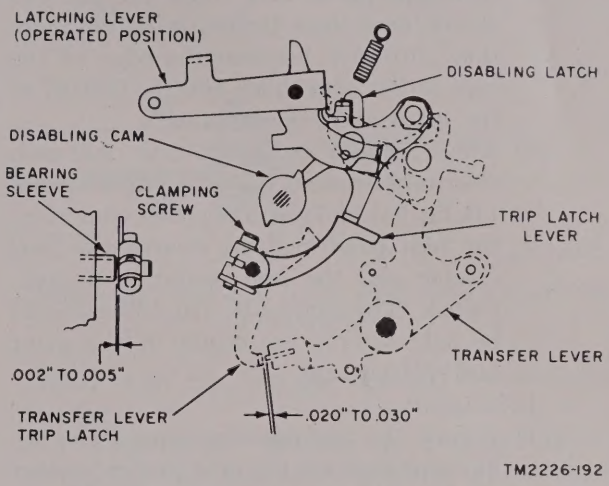


Figure 92. Trip latch lever and disabling cam adjustments.

118. Transfer Lever Spring Adjustment (TT–107B/FG)

(fig. 93)

a. Requirement. It should require 34 to 38 ounces to start the clutch latch arm moving when the transfer lever is in the transferred position.

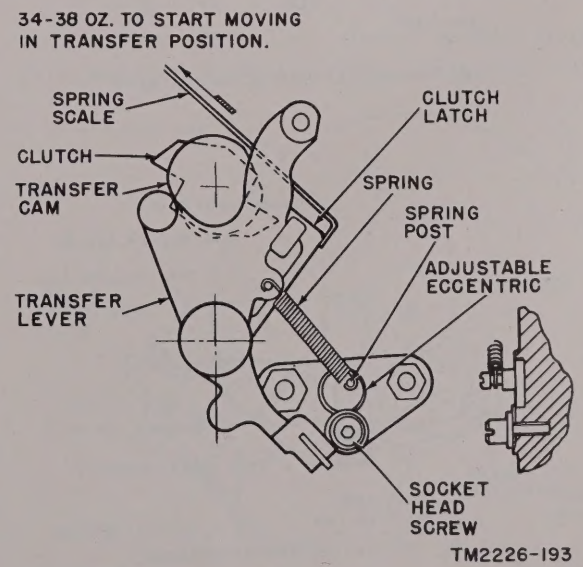


Figure 93. Transfer lever spring adjustment (TT–107B/FG).

b. Adjustment. Loosen the machine screw and turn the transfer lever spring stop eccentric to meet the requirement; tighten the machine screw.

119. Tape Puller Adjustments (TT–107B/FG) (fig. 94)

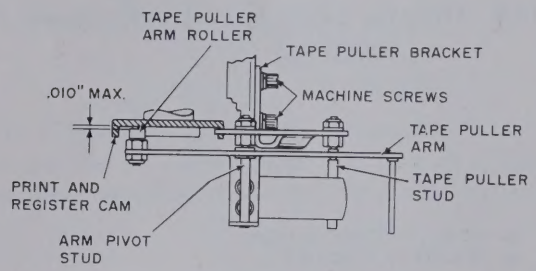
a. Requirements.

(1) The tape puller arm roller (A, fig. 94) should have some clearance but not more than .010-inch between the edge of the tape puller arm roller and the bottom of the print and register cam.

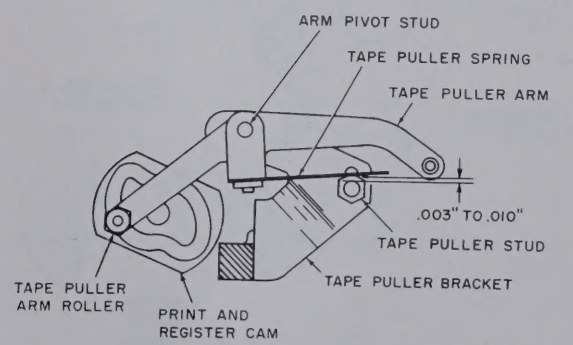
(2) There should be a .003- to .010-inch clearance between the tape puller spring (B, fig. 94) and the tape puller stud when the feed pawl has just cleared the feed ratchet and the feed operation is completed. The tape puller arm roller should be held toward the center of the print and register cam.

b. Adjustments.

(1) Loosen the two machine screws (A, fig. 94) and position the tape puller bracket to meet the requirement. Tighten the machine screws.



A. TAPE PULLER BRACKET ADJUSTMENT



B. TAPE PULLER ARM ADJUSTMENT

TM2226-194

Figure 94. Tape puller adjustments (TT–107B/FG).

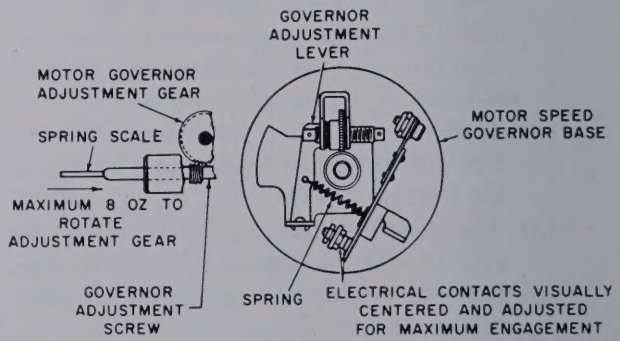
(2) Move the tape puller stud (B, fig. 94) to the bottom of the slot of the tape puller bracket and tighten the tape puller stud nut. Move the arm pivot stud to the right of the slot and tighten the arm pivot stud nut friction tight. Release the transfer lever trip latch and turn the motor by hand until the feed pawl assembly just clears the ratchet wheel and the feed operation is completed. Move the arm pivot stud to the left until there is .003- to .010-inch clearance between the tape puller spring and the tape puller stud. The .003- to .010-inch gap should be measured when the tape puller arm roller is held toward the center of the punch cam. If, when the arm pivot stud is moved all the way to the right, and the clearance is greater than the requirement, loosen the tape puller stud nut and move the tape puller stud upward against the tape puller spring. Tighten the tape puller stud nut. Then move the arm pivot stud to the left until the requirement is met. Tighten the arm pivot stud nut.

Note. To check for completion of the feed operation, turn the ratchet wheel backwards while turning the motor slowly. At the point where the ratchet wheel is just free to turn backwards, the feed operation is completed.

120. Motor Governor Contacts Alinement (TT–109/FG) (fig. 95)

a. Requirements.

(1) The contacts should be visually centered and adjusted for maximum area of engagement.


GOVERNOR ADJUSTMENT LEVER
MOTOR GOVERNOR ADJUSTMENT GEAR
SPRING SCALE
MOTOR SPEED GOVERNOR BASE
MAXIMUM 8 OZ TO ROTATE ADJUSTMENT GEAR
GOVERNOR ADJUSTMENT SCREW
SPRING
ELECTRICAL CONTACTS VISUALLY CENTERED AND ADJUSTED FOR MAXIMUM ENGAGEMENT

TM2226-195

Figure 95. Motor governor contacts alinement (TT–109/FG).

(2) A maximum force of 8 ounces should be required to turn the gear assembly at any point within the operating range of the motor.

b. Adjustment.

(1) Loosen the contact arm spring mounting screw and position the contact arm assembly to meet the requirement.

(2) Check for dirt or bind between the worm and the gear assembly.

121. Tape-Out Alarm Adjustment (TT–107/FG)

(fig. 96)

a. Requirement. The tape alarm buzzer should sound when the alarm lever is moved to within ¼ to ⅜ inch of the tape reel hub.

b. Adjustment. Loosen the self-locking hexagonal nut on the switch actuating stud. Adjust the stud to trip the switch actuating arm latch when the alarm lever is in the position shown. Tighten the self-locking hexagonal nut.

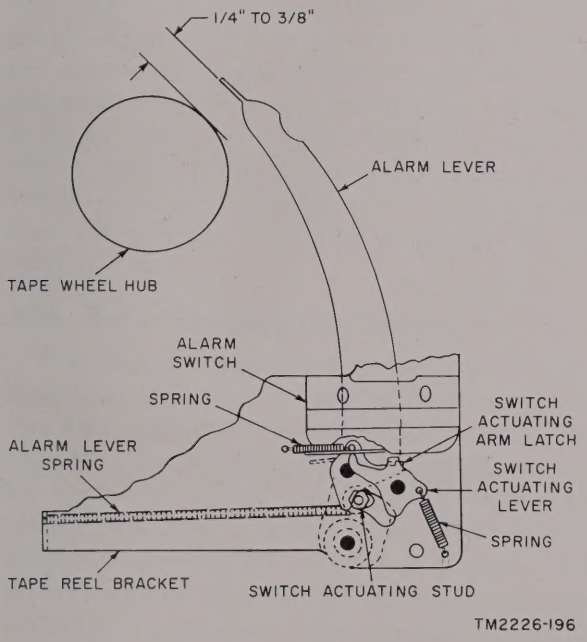


Figure 96. Tape-out alarm adjustment (TT–107/FG).

122. Tape-Out Alarm Preliminary Adjustment (TT–107B/FG)

(fig. 97)

a. Requirements. The alarm switch should be centered from right to left in the elongated holes, and the bottom of the alarm switch should be

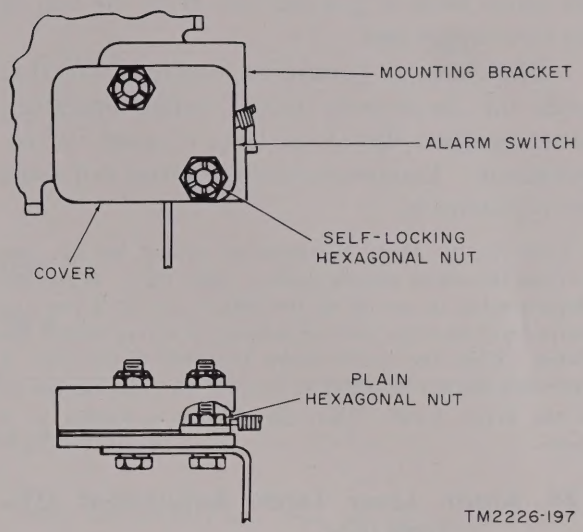


Figure 97. Tape-out alarm preliminary adjustment (TT–107B/FG).

alined with the bottom edge of the mounting bracket.

b. Adjustment. Remove the two self-locking hexagonal nuts that hold the cover on the alarm switch. Remove the switch cover and loosen the two plain hexagonal nuts that hold the alarm switch to the mounting bracket. Position the alarm switch to meet the requirement and tighten the two plain hexagonal nuts. Then replace the cover and tighten the two self-locking hexagonal nuts. Check related adjustment (par. 123).

123. Alarm Lever Adjustment (TT–107B/FG)

(fig. 98)

a. Requirement. The alarm switch should close and the tape-out alarm should sound when

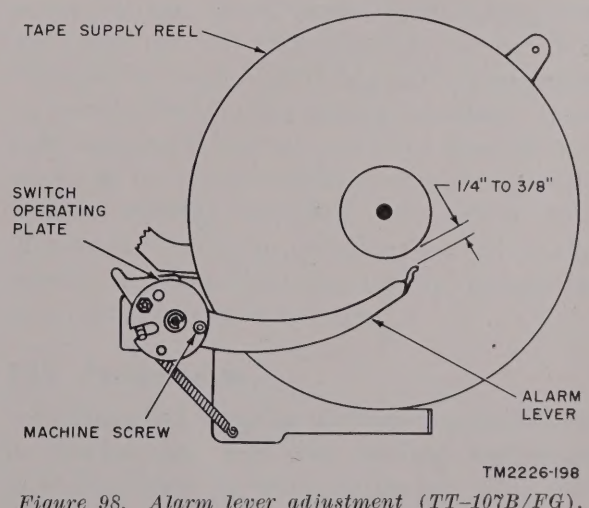


Figure 98. Alarm lever adjustment (TT–107B/FG).

the alarm lever is 1/4 to 3/8 inch from the hub of the tape supply reel.

b. Adjustment. Loosen the machine screw that holds the alarm lever to the switch operating plate; position the alarm lever to meet the requirement. Tighten the machine screw and check the requirement.

Note. If the above requirement cannot be met, reposition the alarm switch slightly (par. 122). When the alarm switch is moved to the left it should allow the alarm lever to move further before the alarm switch operates. When the alarm switch is moved to the right it will allow the alarm switch to operate with less movement of the alarm lever. Then readjust as described in *b* above.

124. Alarm Lever Latch Adjustment (TT–107B/FG)

(fig. 99)

a. Requirement. When the alarm lever is latched in its downward position there should be 1/4- to 3/8-inch clearance between the alarm lever and the lower edge of the tape supply reel.

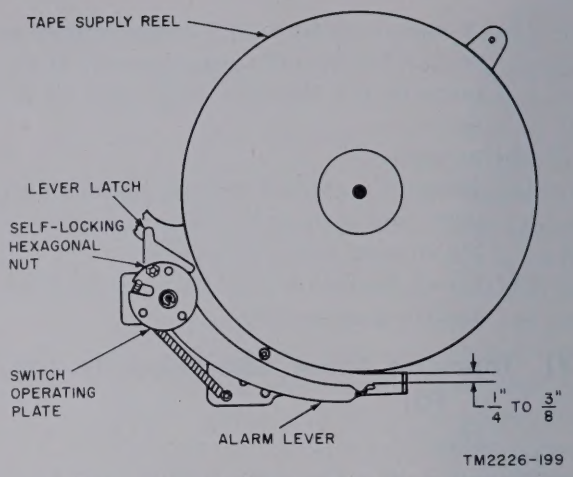


Figure 99. Alarm lever latch adjustment (TT–107B/FG).

b. Adjustment. Loosen the self-locking hexagonal nut that holds the alarm lever latch to the switch operating plate, and position the alarm lever latch to meet the requirement. Tighten the self-locking hexagonal nut and check the clearance.

CHAPTER 5

THEORY

Section I. INTRODUCTION

125. General

This chapter describes the theory of operation of Teletypewriter Reperforators TT–107(*)/FG. and TT–109/FG. The theory of operation for the TT–107/FG, TT–107B/FG, and TT–109/FG is identical unless otherwise indicated. Mechanically, the TT–107B/FG and the TT–109/FG are identical except for the motor and motor filter. Basic principles of teletypewriter communication are contained in paragraphs 126 through 129. The block diagram and power distribution are described in paragraphs 130 through 135. Detailed theory of the reperforators is shown in paragraphs 136 through 150. The circuits of each reperforator are described in detail in paragraphs 151 through 153.

126. Basic Teletypewriter System

The basic teletypewriter system consists of a transmitting device and receiving device connected in a series circuit that includes a source of dc (fig. 3). Messages originated at the distant transmitter consist of groups of code impulses that are transmitted over a signal circuit to the selector magnet of a reperforator or page printer. The selector magnet of each receiving mechanism, controlled by the received code impulses, selects the character or symbol to be printed and punched and performs the selected operation. Most teletypewriter systems are made up of various combinations of transmitters and receivers.

127. Standard Start-Stop, Five-Unit Code

Signal intelligence is transferred between teletypewriters through the use of a standard start-stop, five-unit code. The code group for each of the 26 letters of the alphabet and for each of the functional operations consists of seven marking or spacing impulses. Two of these impulses, the first (start) impulse and let the last (stop) impulse, are used to keep the sending and receiving mechanisms synchronized. The remaining five impulses (selecting) are varied to provide 32 code combinations. These code combinations have been assigned to individual letters and functions as shown in figure 100.

Note. The TT–107B/FG and TT–109/FG print a rectangular block of dots when the letters code combination is received.

128. Signaling

The reperforators may be adapted to receive either neutral or polar signals from the signal line by placing bias switch S2 (fig. 10) in the appropriate position. When neutral signals (A, fig. 101) are being received from the line, current flows through the circuit only during marking impulses; no current flows during spacing impulses. When polar signals (B, fig. 101) are being received from the signal line, current flows on the line constantly. During marking impulses, the current flows through the circuit in one direction and, during spacing impulses, the current flows through the circuit in the opposite direction.

129. Synchronism

Starting and stopping the receiving mechanism in synchronism with the sending mechanism is accomplished by transmitting two additional

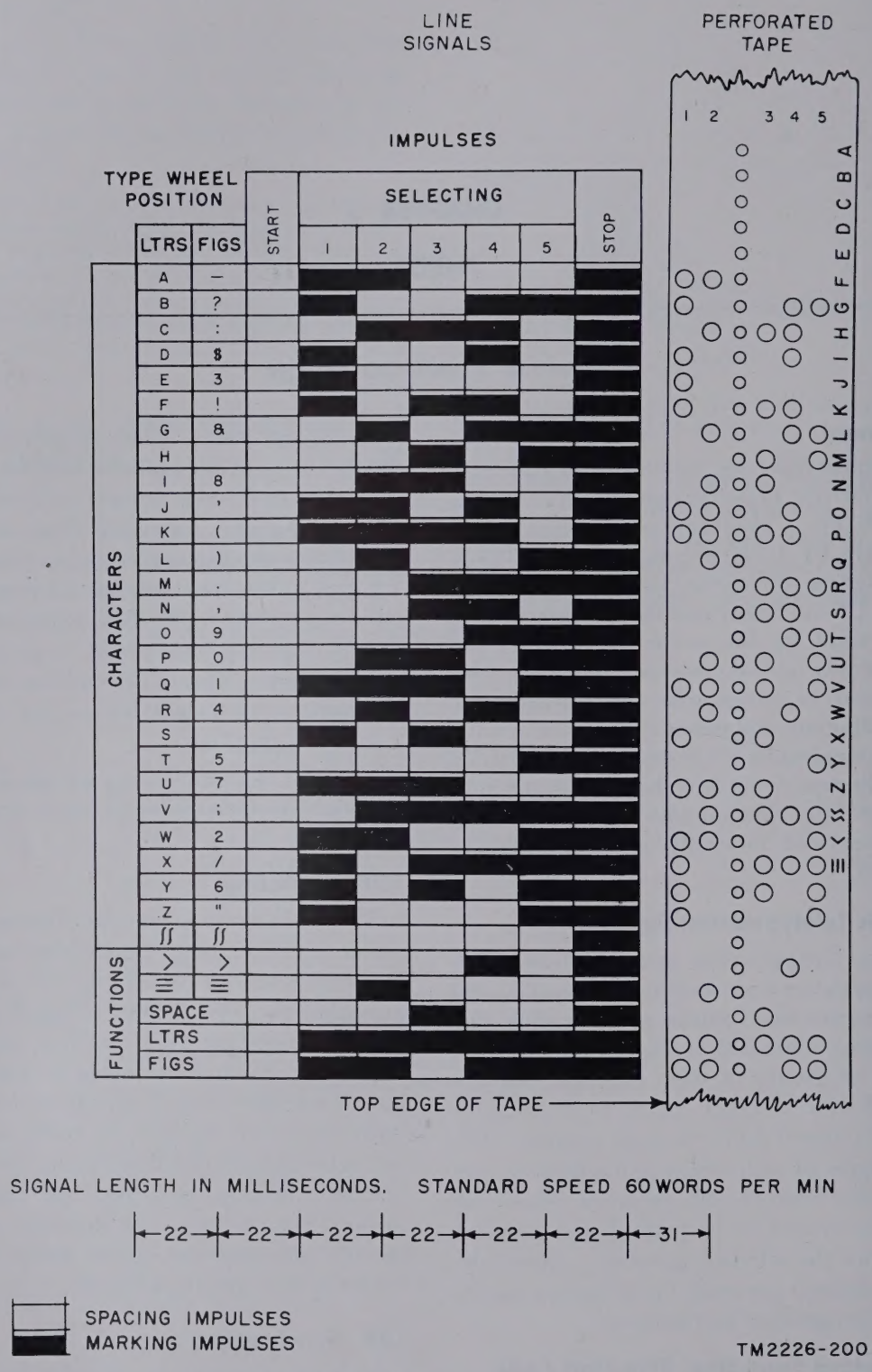


Figure 100. Standard start-stop five-unit code chart.

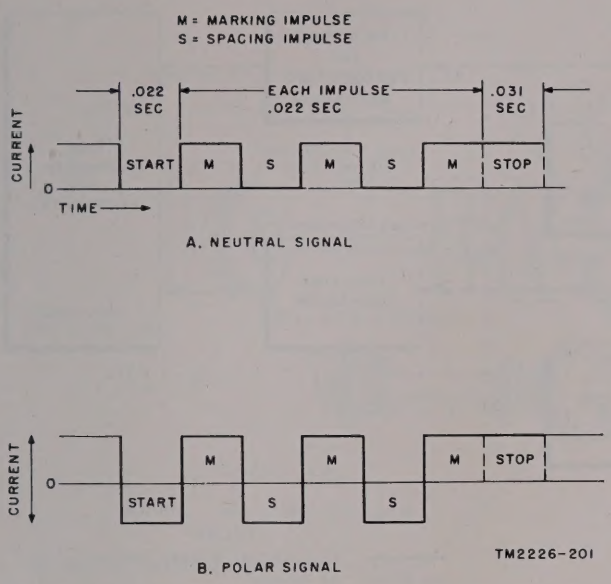


Figure 101. Neutral and polar start-stop five-unit code signals for the letter Y.

impulses with the five-unit code impulses for each character. The start impulse is a spacing impulse sent immediately preceding the five-selecting impulses, and the stop impulse is a marking impulse sent immediately following the five-selecting impulses (fig. 102). The start impulse causes the receiving mechanism to start operation when the sending mechanism starts, and the stop impulse causes the receiving mechanism to stop before the sending mechanism starts again. Therefore, even if the receiving mechanism is operating a bit slowly, it still will be brought to a complete stop before the next code group is sent and so be ready to start in step again. The length of the start impulse is equal to that of one of the five-selecting impulses; the stop impulse is 1.42 times as long as a selecting impulse.

Section II. BLOCK DIAGRAM AND POWER DISTRIBUTION

130. General

The TT–107/FG, TT–107B/FG, and TT–109/FG are self-contained reperforator units capable of receiving 20- or 60-ma, start-stop, five-unit code signals at speeds of 60, 66, 75, or 100 wpm. An internal power supply provides dc current for the selector-magnet bias windings only. Current for the signal line must be supplied from an external source. The TT–107B/FG and the TT–109/FG are identical except for the type of motor used (par. 132).

131. Block Diagram of Reperforators

(fig. 102)

The reperforator receives dc start-stop impulses from the signal line directly into the selector mechanism. A selector magnet converts the electrical impulses into a mechanical arrangement that corresponds to the received code group. This mechanical setting is transferred to the code bar mechanism which determines the character to be printed and the code group to be perforated. The main shaft and function shaft assemblies are driven by the motor and provide the mechanical power to perform the printing, perforating, and functional operation selected by the code bar mechanism.

132. Motors

The motor used with each of the reperforators is mounted on the rear casting above the shaft assemblies. The motor provides the mechanical power to operate the various levers, cams, and shafts used in the printing, perforating, and functional operations. The TT–107/FG and the TT–107B/FG use a synchronous motor and the TT–109/FG uses a series-governed motor.

a. Synchronous Motor (TT–107/FG and TT–107B/FG). The motor requires single-phase, 115-volt, 60-cycle ac and develops $\frac{1}{40}$ horsepower at 3,600 rpm. The motor uses a squirrel cage type armature. A run winding and a start winding to develop the torque are required for operation.

b. Series-Governed Motor (TT–109/FG). This motor requires single-phase, 105- to 125-volt, 50- to 60-cycle, regulated or unregulated ac for operation. The motor develops $\frac{1}{23}$ horsepower at 3,600 rpm. The speed is controlled by a mechanical governor assembly (par. 133) mounted on the rotating motor shaft.

133. Governor (TT–109/FG)

a. The motor governor assembly is adjustable to permit the motor speed to be maintained at precisely 3,600 rpm. The governor is mounted on,

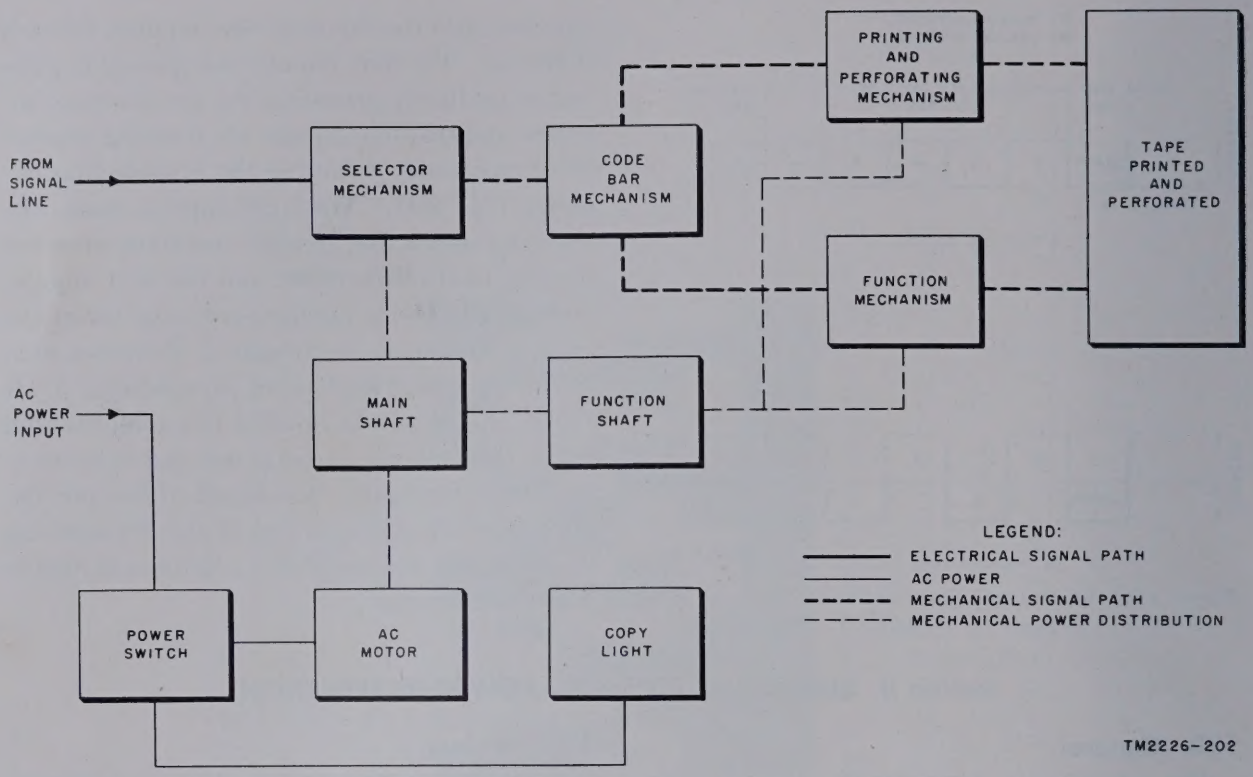


Figure 102. Reperforator, block diagram.

and rotates with, the motor shaft. The governor contact points are connected in series with the field coils (C, fig. 128) and armature of the motor through two sliprings (located on the back of the motor speed governor base), which are contacted by two brushes in the motor housing. The movable electrical contact of the governor (fig. 103) is flexible and is held against the stationary electrical contact by a coil spring until the motor speed exceeds 3,600 rpm. When this occurs, the centrifugal force acting on the movable electrical contact is greater than the tension of the spring. The movable electrical contact then moves away from the stationary electrical contact. The speed at which the contacts will open depends on the tension applied to the spring by the governor adjusting lever. The tension on the spring may be increased or decreased by manipulating the governor wormshaft while the motor is running.

b. The governor worm has two integral threaded portions, one right-hand and one left-hand. Complete instructions for adjusting the motor speed are given in paragraph 15*a*.

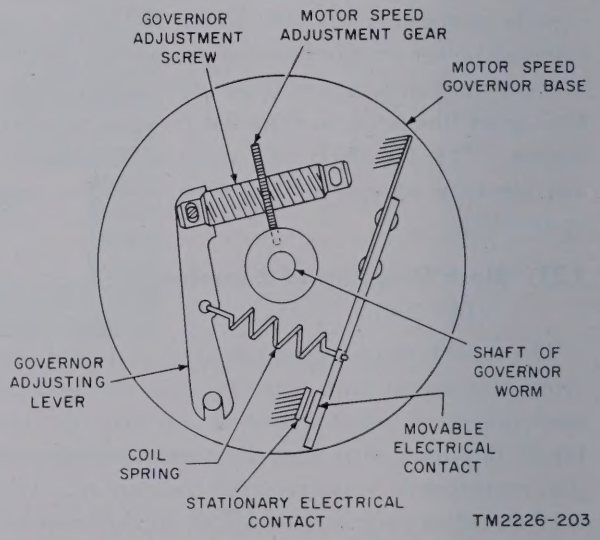


Figure 103. Motor governor, functional view (TT–109/FG).

134. Main Shaft and Power Distribution

Motion is distributed to the mechanisms of the reperforator by the motor through a drive gearset (fig. 104). This drive gearset consists of a removable worm gear on the motor shaft and a fiber

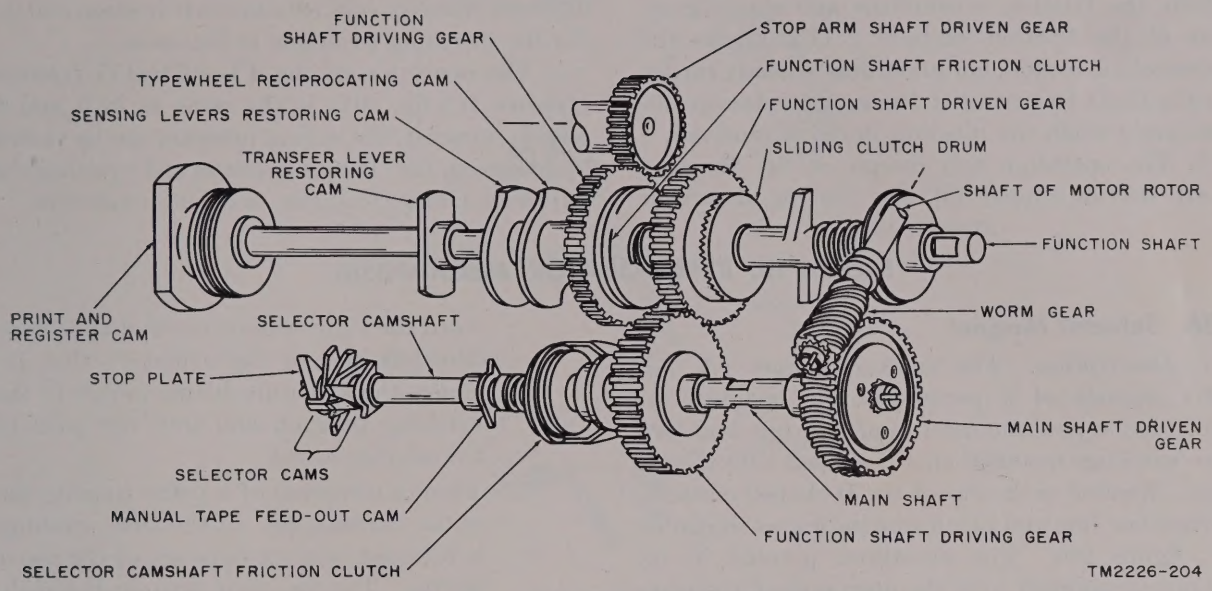


Figure 104. Mechanical power distribution.

worm gear fastened to the right end of the main shaft. The reperforator is equipped with gears for operating at a standard speed of 368.1 (60 wpm) or 600 (100 wpm) opm. When shipped from the factory, the 600- (100 wpm) opm gearset is mounted on the left rear of the base (fig. 8). Alternate 404- (66 wpm) and 460- (75 wpm) opm gearsets are obtainable through normal supply channels. The main shaft rotates constantly when the reperforator is in operation and transfers power to the other shafts and mechanisms through friction clutches and gears.

135. Friction Clutches

a. Power for the selector camshaft (fig. 104) is received through a friction clutch (A, fig. 105) mounted between the selector camshaft and main shaft. The friction clutch makes rapid start and stop actions possible. The driving fork on the main shaft engages the notches on the clutch driver plate of the clutch. Two friction plates are held against the clutch driver plate by spring pressure. The spring pressure can be increased or decreased by tightening or loosening the clutch collar, increasing or decreasing the torque transmitted through the clutch. The clutch driver disk has projections that engage holes in the friction plates. This causes the clutch driver disk and the friction plates to rotate in unison. Friction between these plates and the outer clutch disks is sufficient to rotate the driven shaft under a normal workload. When a greater load is placed on a

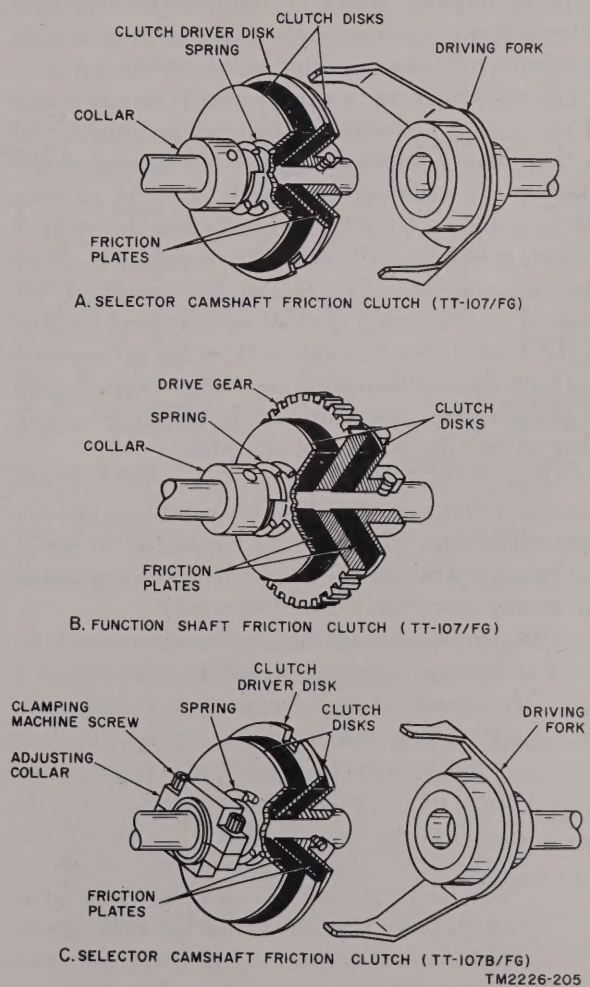


Figure 105. Friction clutches.

clutch, the friction is overcome and slipping occurs at the friction surfaces. This allows the driven shaft to stop, but maintains a steady torque on the shaft to permit it to resume rotation immediately when the blocking force is removed.

b. The operation and design of the function shaft friction clutch (B, fig. 105) is somewhat different from the selector camshaft friction clutch, but its operating principle is the same.

c. The operation of the TT–107B/FG friction clutches (C, fig. 105) is the same as in *a* and *b* above; however, the spring pressure can be varied by loosening the clamping screws and rotating the adjusting collar clockwise or counterclockwise.

Section III. REPERFORATOR MECHANISM

136. Selector Magnet

a. Description. The selector magnet (A, fig. 106) consists of a permanent bar magnet, an armature, a potentiometer, and two line and two bias windings mounted on a U-shaped silicon-steel core. Around each arm of the U-shaped core are wound one line and one bias winding as shown in B^1, figure 106. The armature, pivoted in its center, is mounted over the open end of the core. During operation of the magnet, reception of a marking impulse causes one end of the armature to be pulled toward one arm of the U-shaped core. Reception of a spacing impulse causes the opposite end of the armature to move toward the other arm of the core. The selector magnet is constructed so that when current is not present in any of the windings, a balanced magnetic field is present (B^1, fig. 106). Under this condition, the permanent magnet is the only source of magnetism. Note that the magnetic flux at the lower end of the magnet (north pole) divides equally and returns to the south pole through both arms of the core and both sides of the armature. The magnetic pull of the cores on the armature is therefore equal, when all windings are not energized.

b. Operation With Polar Signals. When operating in polar circuits, the bias windings are not used. The line windings are connected in series for 15-ma operation (B^2, fig. 106) and in parallel for 30-ma operation (not illustrated).

(1) During a marking impulse, current flows through the line windings. Terminal 8 is positive and terminal 4 is negative. The magnetic field set up by the line winding around the left arm *opposes* the field of the permanent magnet, and little pull is present on the left side of the armature. The magnetic field set up by the line winding around the right arm of the core is poled to *aid* the field of the permanent magnet and, therefore, the right end of the armature is pulled toward the right arm of the U-shaped core. The left end of the armature that includes the armature blade, moves to the marking position and into the path of the selector levers.

(2) During reception of a polar spacing impulse, current flow in the line windings is reversed, and the opposite of the above occurs. The magnetic pull on the right end of the armature is *weakened* and the pull on the left is *increased*, causing the armature to be drawn toward the left arm of the core.

c. Operation with Neutral Signals. When operating in neutral circuits, the bias windings are wired in series and are energized constantly. The magnetic field set up by the left bias winding is poled to *aid* the magnetic field of the permanent magnet. The field of the right bias winding *opposes* the field of the permanent magnet. During reception of a neutral spacing impulse, current is not present in the line windings. The combined magnetic fields of the energized bias windings and the permanent magnet cause the blade end of the armature to be pulled toward the left core, away from the selector levers. Current flows in both line windings during reception of a neutral marking impulse. The current value in a line winding normally is twice the bias current value. The field set up by the energized line winding around the left core opposes the combined magnetic fields of the left bias winding and the permanent magnet. The energized line winding around the right core *aids* the field of the permanent magnet and *opposes* the field of the right bias winding. Therefore, a marking impulse in the line windings will cause the right end of the armature to be pulled toward the right core arm, and the left (blade) end is moved into the path of the selector levers (marking position). Neutral operation of this selector magnet is possible in both 20- and 60-ma circuits. The line windings are connected

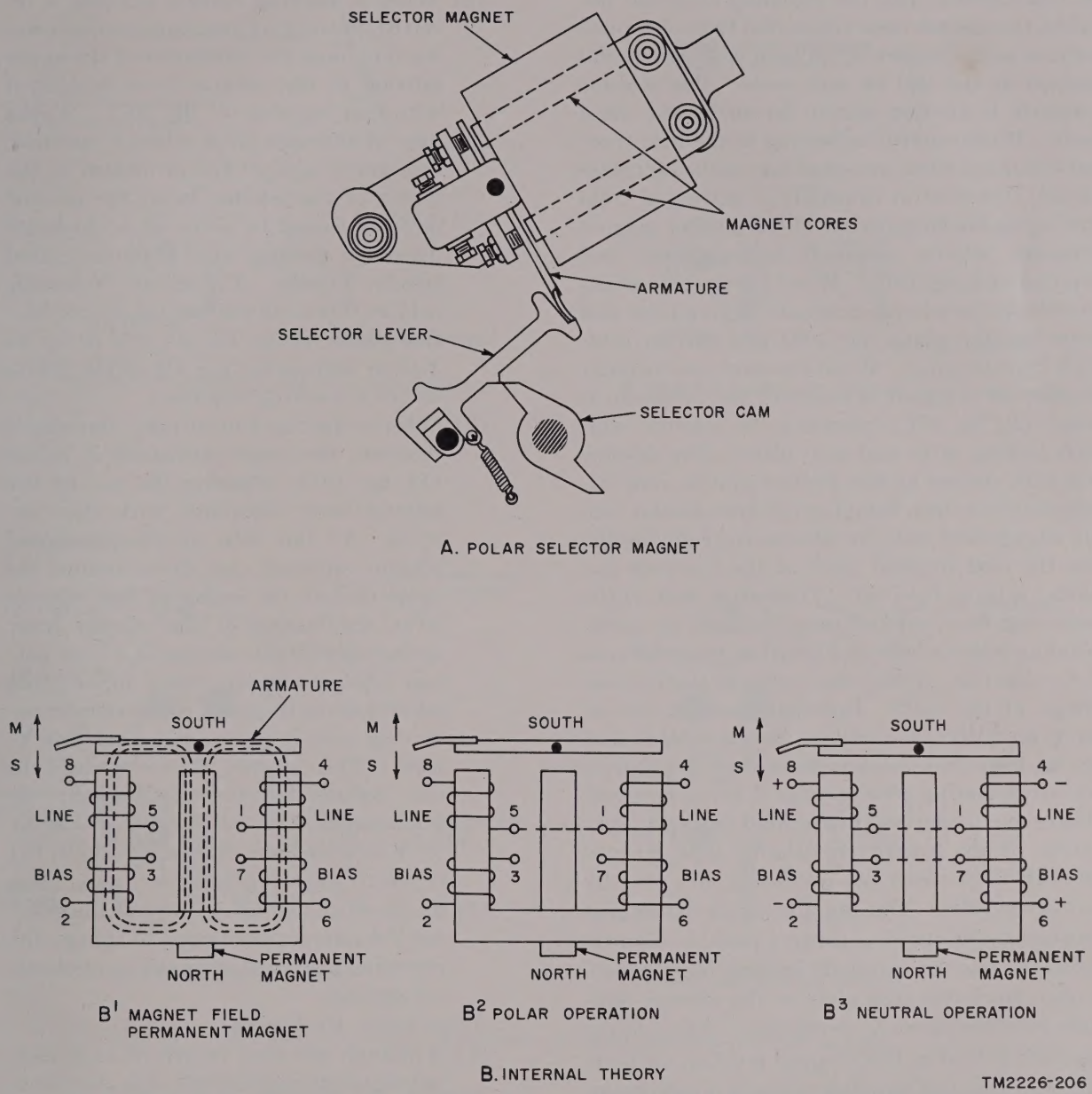


Figure 106. Polar selector magnet operation.

in series for 20-ma neutral operation and in parallel for 60-ma neutral operation. Adjustment of the bias current value to obtain the most advantageous machine range is accomplished with a potentiometer that is connected in series in the bias circuit.

137. Selector Mechanism Operation

The selector mechanism translates received code impulses into a mechanical selection that will result in the printing and punching of the proper character or the selection of some functional operation. Operation of the selector mechanism begins with reception of the start impulse of a code group. The start impulse permits the selector camshaft to begin ½ revolution. When started, the selector mechanism records each of the five code impulses in the form of a mechanical position as each is received. Reception of the stop impulse immediately after the fifth code impulse stops rotation of the selector camshaft.

a. Starting and Stopping Selector Camshaft (Synchronization). To synchronize operation of

the reperforator with the incoming electrical impulses, the selector cams are started from a stopped position at the beginning of each code group and stopped at the end of each code. The selector camshaft is friction clutch driven by the main shaft. When current is flowing in the line (normal condition when messages are not being transmitted), the selector camshaft is prevented from turning by the engagement of the selector magnet armature, selector camshaft locking lever, and stop plate (A, fig. 107). When lowered the armature blocks the selector camshaft locking lever and keeps the stop plate (fig. 108) and selector camshaft from turning. When the start (no current) impulse for a signal is received, the armature is raised (B, fig. 107), releasing the selector camshaft locking lever and stop plate. The selector camshaft, driven by the friction clutch, immediately starts to turn, bringing the first selector cam into engagement with its selector lever during the time the next impulse (first of the five code impulses) is being received. Thereafter, each of the remaining four selector cams engages its corresponding selector lever in a timed sequence because of the location of the cams around the circumference of the shaft. Rotation speed of the selector camshaft causes each of the five cams to contact its respective selector lever during the time the corresponding code impulse is being received. All five selector levers are operated during ½ revolution of the selector camshaft. The selector camshaft is limited to ½ revolution at a time by the stop impulse. This impulse moves the magnet armature to the marking (lower) position where it blocks the selector camshaft locking lever which, in turn, blocks the stop plate on the selector camshaft as it completes ½ revolution. The selector camshaft is held in this stopped position until reception of the start impulses of the next code group releases the selector camshaft locking lever as described above.

b. Recording Code Impulses.

(1) Each of the five code impulses of the code group is recorded in the form of clockwise or counterclockwise movement of the five corresponding selector **Y**-levers that are mounted on a common **Y**-lever pivot post stud. This is accomplished through the interaction of the selector magnet, the selector camshaft cams, and the selector levers.

(2) When a marking current impulse is received, the magnet armature moves downward to block the movement of the upper portion of the selector lever associated with that impulse (C, fig. 107). As the lobe of the associated selector camshaft cam moves against the projection in the center of the selector lever, the selector lever is forced to move in a clockwise direction, moving with it its associated selector **Y**-lever. The selector **Y**-lever is held at this clockwise setting by its friction plates on the TT–107/FG or by its **Y**-lever detents on the TT–107B/FG to record a marking impulse.

(3) When a spacing (no current) impulse is received, the maget armature is raised (D, fig. 107), releasing the top of the selector lever associated with that impulse. As the lobe of the associated selector camshaft cam moves against the projection at the center of the selector lever, the tension of the selector lever spring retards the movement of the bottom of the selector lever, forcing the selector lever to rotate counterclockwise, moving with it its associated selector **Y**-lever. The selector **Y**-lever is held in this counterclockwise position by its friction plates on the TT–107/FG or by its **Y**-lever detents on the TT–107B/FG to record a spacing impulse.

(4) In the same manner, all five of the selector **Y**-levers are positioned to change the incoming electrical impulses to mechanical settings.

c. Rangefinder Mechanism.

(1) Although the time length of each code impulse is 22 milliseconds, only about one-fifth of that time is required for the selector cam to position a selector **Y**-lever. Under ideal conditions, maximum reliability is obtained when the selector **Y**-lever positioning time occurs during the middle portion of the 22 milliseconds. The rangefinder setting determines which portion of each impulse is used for the positioning of its respective selector **Y**-lever.

(2) The rangefinder mechanism is provided to allow the operator or mechanic to make an adjustment of the angular posi-

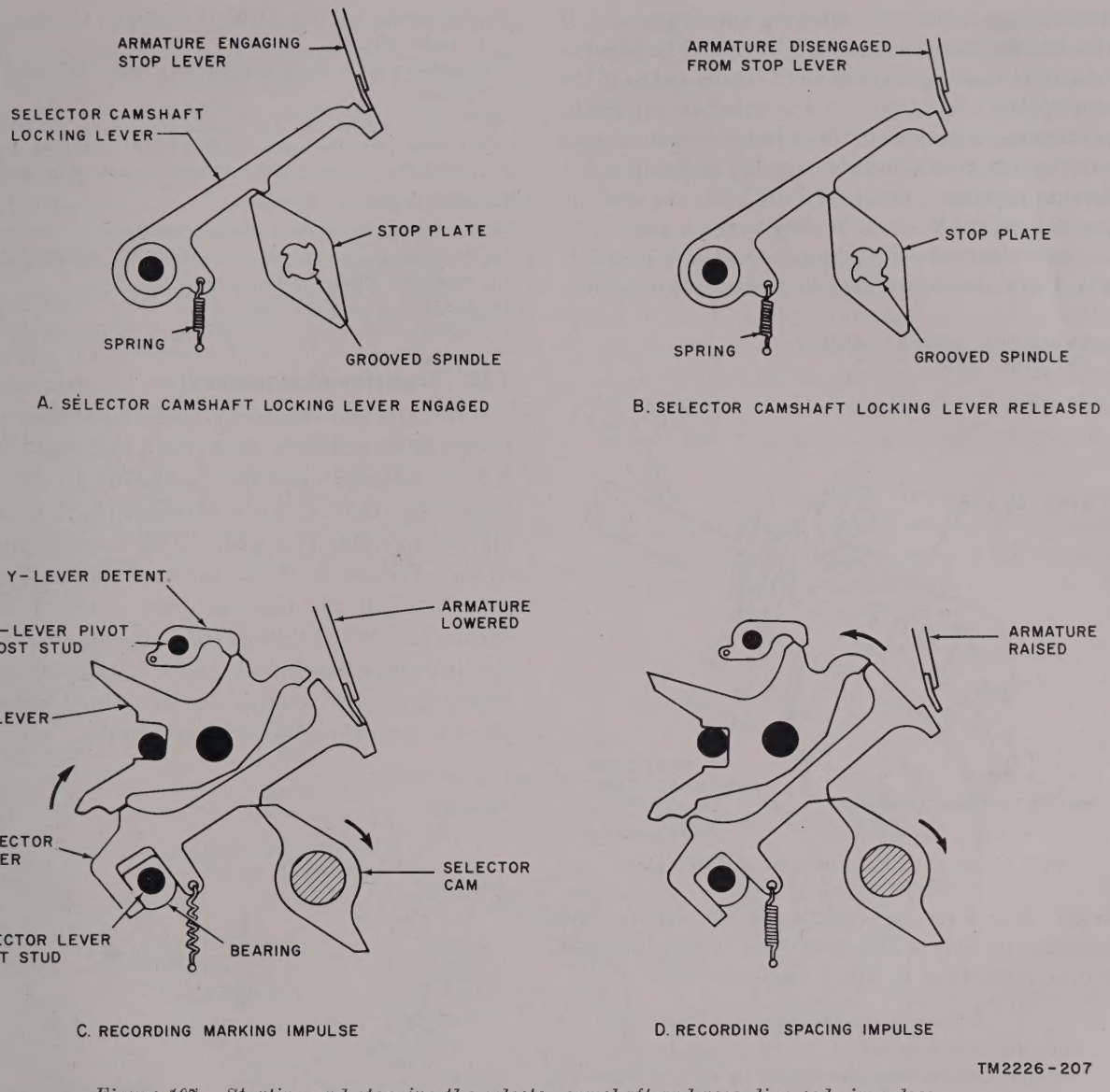


Figure 107. Starting and stopping the selector camshaft and recording code impulses.

tion relationship between the selector camshaft cams and the stop plate (fig. 108). Increasing the angle between the cams and the stop plate causes the selector cams to position the selector **Y**-levers later during each code impulse. Decreasing the angle causes the selector **Y**-levers to be positioned earlier during each code impulse.

(3) The angular position of the stop plate is controlled by the position of the grooved spindle. The angle is increased whenever the spindle is moved inward and is decreased whenever the spindle is moved outward. The position of the grooved spindle is controlled by the rangefinder dial assembly and rangefinding cam. Clockwise rotation of the rangefinder dial assembly causes the rangefinding cam to push the spindle inward, and the selector **Y**-levers are positioned later during each code impulse. Counterclockwise rotation of the rangefinder dial asembly has the opposite effect.

d. Selector Operation Sequence Chart. Just prior to the receipt of a code group, the current in the signal line holds the armature of the se-

lector magnet lowered, latching the upper end of the selector camshaft locking lever. The selector camshaft locking lever is held in the path of the stop plate (fig. 108) on the selector camshaft, preventing rotation of the selector camshaft and causing the friction clutch to slip without transferring rotation. On the TT–107/FG the friction plates hold the Y-levers as they were positioned by the last received code group. On the TT–107B/FG, the Y-levers are held in position by their de-

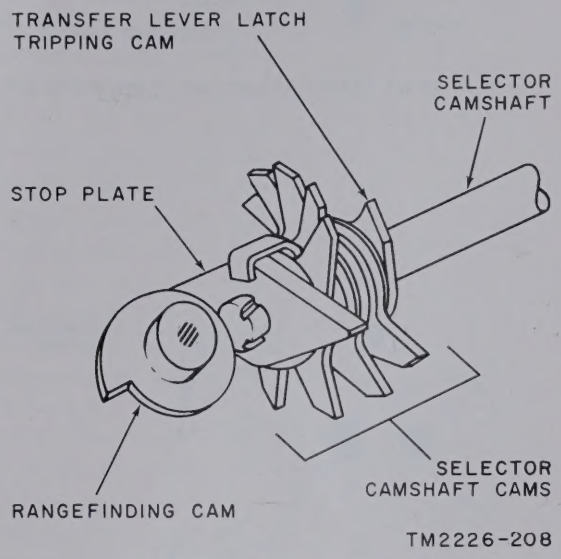


Figure 108. Selector camshaft and stop plate.

tents. The sequence chart below summarizes the sequence of operations that occur when the code group is received by the reperforator.

Selector operation sequence chart

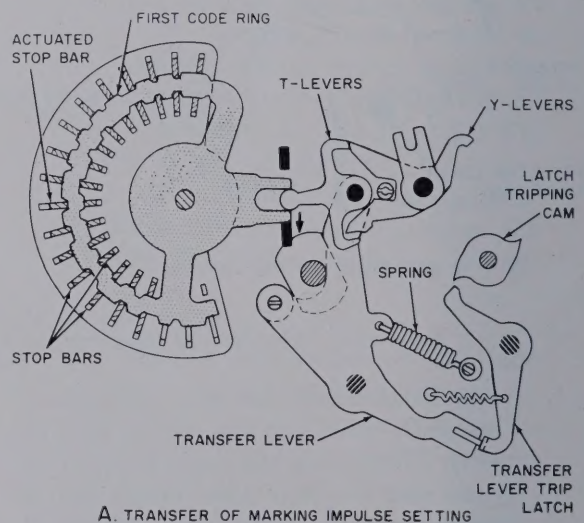
1. Start impulse received.
2. Selector magnet armature moves to space position.
3. Armature releases selector camshaft locking lever.
4. Locking lever releases stop plate.
5. Selector camshaft starts rotating, driven by the friction clutch.
6. First code impulse moves armature to mark or space position, depending on whether code impulse is a marking or spacing impulse.
7. First selector cam lifts first selector lever.
8. First selector lever pivots on the end of armature if armature is in marking position or on selector lever pivot stud if armature is in spacing position.
9. First selector lever pushes first Y-lever clockwise if selector lever is pivoting on the armature end (marking), or counterclockwise if selector lever is pivoting on the pivot stud (spacing).
10. Second, third, fourth, and fifth code impulses, in turn, are recorded in the corresponding parts of the selector mechanism, as described for the first code impulse. Each Y-lever is positioned clockwise or counterclockwise as determined by its associated code impulse.
11. Transfer lever latch tripping cam turns transfer lever latch.

Note. The actions described in the transfer operation and function shaft operation sequence chart (par. 138) begin at this point in the overall sequence of equipment operation.

12. Stop impulse is received.
13. Armature moves to marking position.
14. Stop plate engages selector camshaft locking lever.
15. Armature latches locking lever.
16. Locking lever holds stop plate.
17. Selector camshaft stops at end of ½ revolution.

138. Transfer Mechanism

After the five selector Y-levers have been positioned as described in paragraph 137, the selector Y-lever settings must be transferred to the code rings (fig. 109) and the function shaft must be allowed to rotate (fig. 110). This is accomplished by five T-levers that are mounted on the T-lever pivot stud of the transfer lever. The T-levers engage the slotted tails of the code rings and pivot the code rings either clockwise or counterclockwise, depending upon whether the associated code impulse is a marking or spacing impulse.



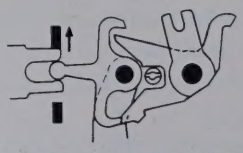


Figure 109. Transfer lever operated.

a. The transfer operation occurs immediately after the fifth code impulse is stored in the selector **Y**-levers. The transfer lever latch tripping cam (fig. 109) on the selector camshaft moves against the transfer lever trip latch, pivoting the transfer lever trip latch counterclockwise against the tension of its spring. The lower arm of the transfer lever trip latch moves out of engagement with the transfer lever and permits the transfer lever spring to snap the transfer lever clockwise, moving the **T**-levers into engagement with the selector **Y**-levers. Each selector **Y**-lever positioned in a clockwise direction will cause its associated **T**-lever to pivot counterclockwise. The **T**-lever, in pivoting, will cause its associated code ring to pivot clockwise. A selector **Y**-lever pivoted clockwise will cause its associated code ring to pivot clockwise; a selector **Y**-lever pivoted counterclockwise will cause its associated code ring to pivot counterclockwise.

b. Each code ring has a unique arrangement of notches cut into the inner and outer edges of the curved portion of the code ring (fig. 111). After the transfer lever has positioned the code ring, the rings are arranged with a notch of each ring lined up with the notches of the other four at one point on their circumference. At this point, the notches form a groove into which one stop bar moves under pressure of a compression spring. This movement places the selected stop bar into the path of the selector stop arm to control the degree of turn of the selector stop arm for proper character or function selection. At the same time, the previously selected stop bar is moved to the unselected position by the sloped high portion of one or more of the code rings.

c. The 32 stop bars are arranged in one inner and one outer row about a semicircle in the code ring cage (fig. 112). The ends of the outer stop bars move inward when selected (fig. 111). The

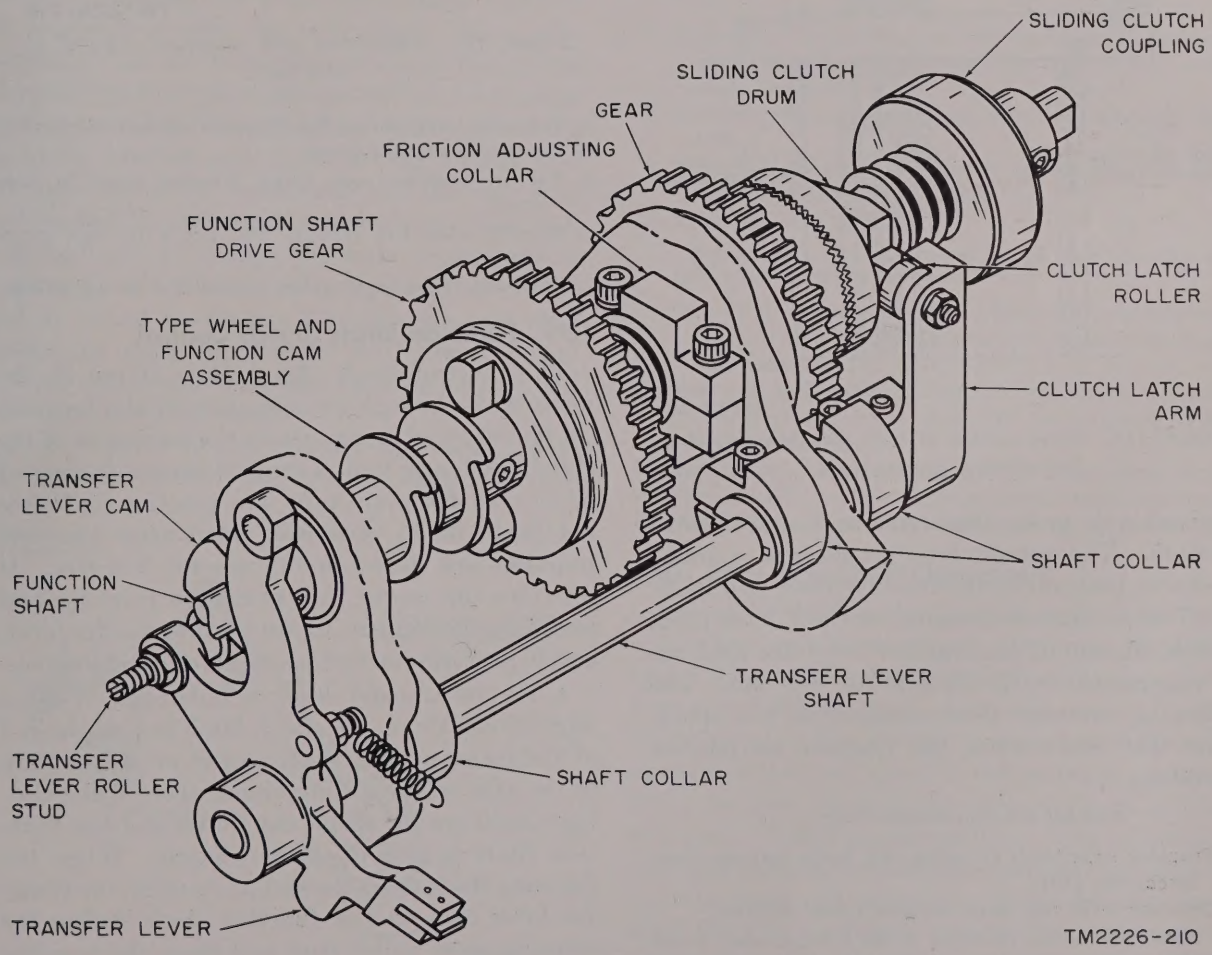


Figure 110. Function shaft sliding clutch drum engaged.

ends of the inner stop bars move outward when selected. The selector stop arm (fig. 114) has one inner and one outer projection on each end for engaging a selected stop bar. The inner projections of the stop arm halt the arm halfway between the outer projection stop positions. The character or function assigned to each stop bar is shown in figure 112.

d. Just prior to the stop bar selector operation, the five selector Y-levers, the five T-levers, and the code rings are positioned as they were by the last received code group. The stop bars (fig. 109) are all held in the unselected position by one or more code rings, except the code bar selected by the last

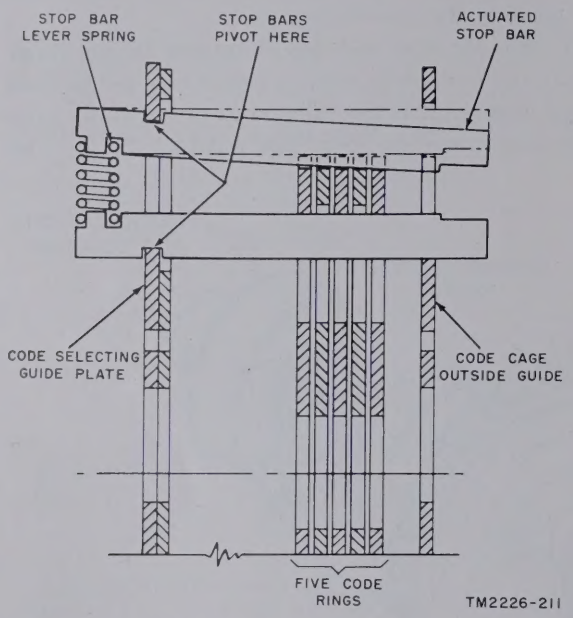


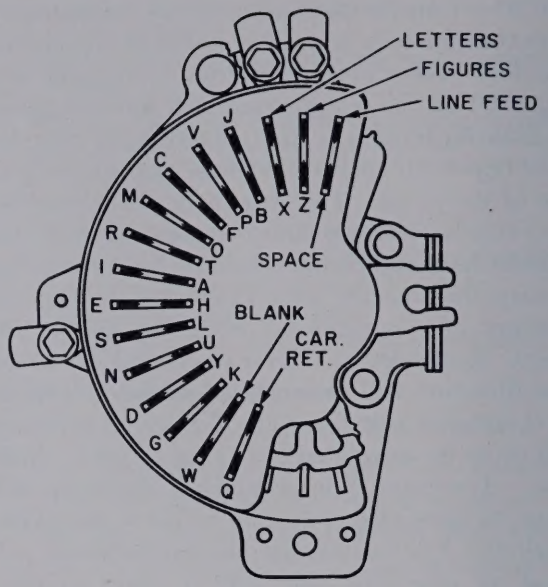
Figure 111. Cross section of code ring showing stop bar selected by code rings.

received code group that remains in the selected position. The transfer lever is held in its counterclockwise position by the transfer lever trip latch. The T-levers that are mounted on the T-lever pivot stud at the top of the transfer lever are held out of engagement with the selector Y-levers. The following sequence chart summarizes the operations that occur when the transfer mechanism operates.

Stop bar selection sequence chart

1. Transfer lever latch stripping cam turns transfer lever latch (fig. 110).
2. Transfer lever trip latch releases transfer lever.

Note. The action described in the function shaft clutch control sequence chart begins at this point in the sequence of operations.



VIEWED FROM FRONT OF REPERFORATOR

TM2226-212

Figure 112. Characters and functions selected by stop bars.

3. Transfer lever moves five T-levers against Y-levers.
4. Y-levers position T-levers.
5. T-levers position code rings, forming notch in code rings.
6. Selected stop bar pushed into notch in code rings (fig. 111).
7. Previously selected stop bar pushed out by code rings.

139. Function Shaft Clutch Control

The function shaft (fig. 110) is driven by the main shaft through the operation of the function shaft clutch and is engaged by the movement of the clutch latch arm that is firmly fastened to the end of the transfer lever shaft. The function shaft does not begin its ½ revolution until after the code impulses are stored in the selector Y-levers. It provides the power to operate the printing and punching mechanism, to restore the transfer lever, and to perform the various reperforator functions.

a. As the transfer lever is unlatched, it turns slightly clockwise, the clutch latch arm at the end of the transfer lever shaft moves out of the path of the arm on the sliding clutch drum. The sliding clutch spring closes the clutch and the function shaft begins its ½ revolution. When the function shaft nears the end of its cycle, the transfer lever cam on the function shaft strikes the transfer lever roller stud and cams the transfer lever counterclockwise beyond its latched position,

permitting it to be latched by the transfer lever trip latch. As the transfer lever shaft rotates slightly, it moves the clutch latch arm back into the path of the arm of the sliding clutch drum. When the arm of the sliding clutch drum strikes the clutch latch, the clutch members are cammed out of engagement and stop the rotation of the function shaft.

b. To prevent the code rings from shifting after the code group has been set up in them, a code-ring locking mechanism holds the code rings in place through almost ½ revolution of the function shaft. This is accomplished by a code-ring locking bail (fig. 113) that is operated by cam studs on the type wheel and function lever cam of the function shaft friction clutch through the code-ring locking bail cam follower. While code impulses are being stored in the selector mechanism, the function shaft is motionless and one cam stud is positioned under the code-ring locking bail cam follower, holding the code-ring locking bail out of engagement with the code rings. When the function shaft starts to rotate, the cam stud moves counterclockwise out of the path of the code-rings locking bail cam follower. The code-ring locking bail cam follower and the code-ring locking bail are mounted on the same shaft and the code-ring locking bail pivots with the code-ring locking bail cam follower to engage the code rings, locking them in place. When the function shaft nears the end of its ½ revolution, the opposite cam stud moves the code-ring locking bail cam follower upward, moving with it the code-ring locking bail to release the code rings.

c. Just prior to the transfer operation which starts the rotation of the function shaft, the sliding clutch drum is held out of engagement with the mating clutch gear by the clutch latch arm. The clutch gear is rotating, driven by a gear on the main shaft. The transfer lever is held in the latched position by the transfer lever trip latch. The code-ring locking bail is held out of engagement with the code rings. The following sequence chart summarizes the operations that occur when the transfer lever is released by the transfer lever trip latch.

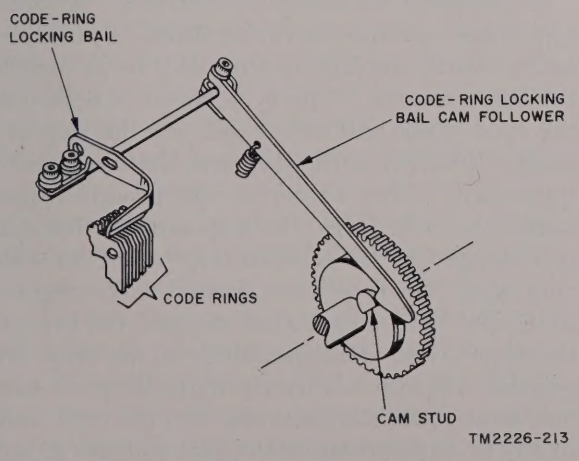


Figure 113. Code ring locking mechanism.

Function shaft sequence chart

1. Transfer lever trip latch releases transfer lever (fig. 110).
2. Transfer lever, transfer shaft, and clutch latch arm turn.
3. Sliding clutch drum stop arm released by clutch latch arm.
4. Sliding clutch drum engages.
5. Function shaft starts rotating.

Note. The action described in the printing operation sequence chart, begins at this point in the sequence of operations.

6. Code-ring locking bail cam follower moves off the cam stud pivoting code-ring locking bail to lock code rings (fig. 113).
7. Transfer lever restoring cam lifts transfer lever (fig. 109).
8. T-levers move clear of Y-levers, and clutch latch arm returns to latching position.
9. Transfer lever latches.

Note. The action described in the printing operation sequence chart ends at this point.

10. Cam stud strikes code-ring locking bail cam follower pivoting code-ring locking bail to release code rings (fig. 113).
11. Near the end of ½ revolution of the function shaft, sliding clutch drum stop arm meets clutch latch arm ball bearing.
12. Sliding clutch drum disengaged by clutch latch arm.
13. Clutch latch arm holds sliding clutch drum stop arm.
14. Function shaft stops at completion of ½ revolution.

140. Stop Arm Shaft Operation

Driven by the function shaft through a friction clutch and gear arrangement, the stop arm shaft (fig. 114) turns the stop arm shaft driven gear and type wheel driven gear. The stop arm and type wheel are alined so that the desired character will appear on the type wheel in the printing position when the selected stop bar stops rotation of the stop arm. Therefore, the position of the code rings and stop bars determines the character or symbol to be printed and punched. Since the stop arm shaft must be positioned accurately, any tendency of the shaft to travel in a reverse direction must be prevented. An antibounce clutch (fig. 115),

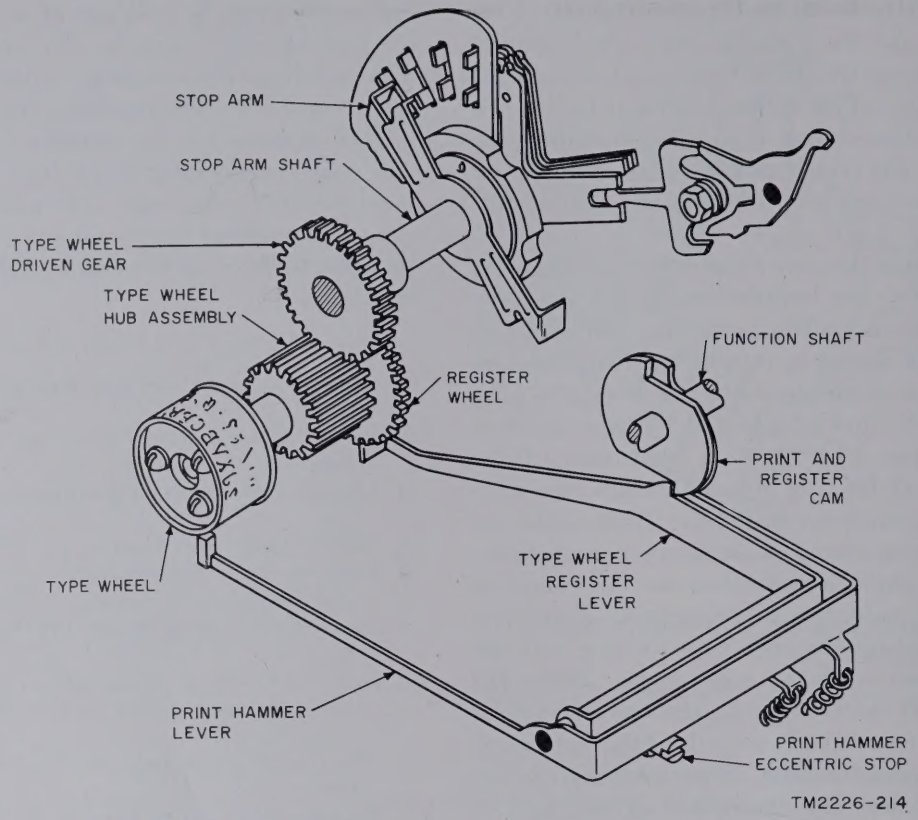


Figure 114. Selecting and printing, functional diagram.

mounted on the stop arm shaft between the code-ring cage and the selector stop arm, serves this purpose. The central portion of the clutch is fastened to the stop arm shaft. The outer part of the clutch is locked in place by a stud on the code-ring cage. Four rollers in the clutch are spring loaded in notches cut into the center portion of the clutch at an angle that permits only clockwise rotation of the stop arm shaft. The rollers roll along the inside surface of the cylindrical housing. Any attempt to make the shaft rotate counterclockwise immediately causes the rollers to jam between the housing and the moving part of the clutch.

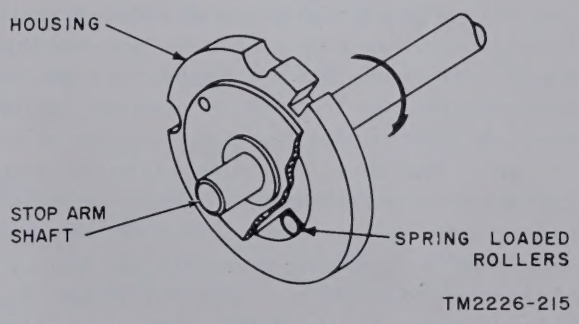


Figure 115. Antibounce clutch for stop arm shaft.

Therefore, travel in a reverse direction is prevented.

141. Printing Operation

The printing operation in reperforators is accomplished by the mechanism shown in figure 114. Portions of the selector and transfer mechanisms in this illustration show the relationship between all mechanisms concerned.

a. Selecting Character or Symbol. A round type wheel contains the raised letters of the alphabet, symbols, and figures that may be printed by this reperforator. The type wheel is driven by the type wheel hub driven gear on the stop arm shaft. Rotation of the stop arm shaft rotates the type wheel. After a received code group has positioned the code rings, the stop arm rotates until it is stopped by the selected stop bar of the code-ring cage. The type wheel, geared to the stop arm shaft, also rotates and, when stopped, the letter on the type wheel corresponding to the stop arm position will appear directly above the print hammer lever. The stop arm can stop the type wheel in any of 32 positions, as the unit includes 32 stop bars, each in a different position in the code-ring

cage. Of the 32 possible type wheel positions, 26 are used for letters of the alphabet, 3 are for symbols, and 3 are blank and do not print. When the type wheel moves to the figures-shift position, the type wheel positions are used for printing numbers, punctuation marks, and communication symbols (fig. 100). Rotation of the stop arm, therefore, controls rotation of the type wheel which, in turn, brings the desired character to the printing position directly above the print hammer lever. The function shaft and the stop arm shaft begin rotating at the same time. Because of the gear ratio between the two shafts, rotation of the stop arm to the selected stop bar is always completed well in advance of the printing or punching action. This applies in all cases except when a selection is repeated. The stop arm, in this case, remains in the previously chosen position without any stop arm shaft motion. Operated by another mechanism, the print hammer lever moves upward sharply at the proper instant striking the paper tape and inking ribbon against the character on the type wheel.

b. Printing Character or Symbol. The printing operation follows the positioning of the stop arm and is controlled by rotation of the print and register cam on the function shaft (fig. 114). The type wheel register lever, riding against the print and register cam on the function shaft is pulled sharply upward by spring action when a high part of the cam passes the contacting surfaces of the type wheel register lever. The blade at the left end of the register lever engages a notch of the register wheel, locking the type wheel in the desired character position. At the same time, the print hammer eccentric stop attached to the register lever moves downward, no longer blocking rotation of the print hammer lever. As a high portion of the print cam rotates past the contacting surfaces of the print hammer lever, the print hammer lever is pivoted sharply upward by a spring. The print hammer lever strikes the paper tape pressing the inking ribbon against the desired character on the locked type wheel. After the character has been printed, the print and register cam moves the type wheel register lever downward, disengaging the register wheel and the type wheel is free to rotate for printing the next character. Printing does not occur when the letters shift, figures shift, or space code group is received. The stop bars for these operations halt rotation of the stop arm at a point where the highest portion of the register wheel is stopped directly above the register lever blade. When the print and register cam permits the type wheel register lever to begin moving upward, it strikes against the portion of the register wheel that has no teeth cut into it. This prevents the register lever from moving fully to the upward position, and the print hammer eccentric stop continues to block rotation of the print hammer lever. With the print hammer eccentric stop in this position, the print hammer lever cannot follow the print cam surface, and printing is prevented. The printing operation is summarized in the chart below.

c. Printing Operation Sequence Chart. Just prior to the printing operation, the incoming code group has been set up in the selector Y-levers and in the code rings, the print hammer lever (fig. 114) is in its released position, the type wheel register lever is cammed away from the register wheel by the print and register cam, and the function shaft has just begun its ½ revolution. The following sequence chart summarizes the operations that occur when the printing mechanism operates.

Printing operation sequence chart

1. Printing operation sequence started by transfer operation; function shaft starts to rotate.
2. Stop arm is released by the previously selected stop bar. Function shaft friction clutch operates, permitting the friction shaft drive gear to rotate the stop arm shaft.
3. Type wheel driven gear on the stop arm shaft rotates type wheel hub assembly and type wheel.
4. Type wheel reciprocating drive lever begins a push type wheel reciprocating transfer lever toward figures-letters shift lever (par. 146).
5. Stop arm stopped by selected stop bar. Type wheel stopped in corresponding position. Function shaft friction clutch is overcome, stopping the driving gear and stop arm shaft.
6. Type wheel moves forward, carrying the inking ribbon with it. Forward movement of the type wheel is halted by figures-letters shift lever and held under spring tension.
7. Register cam releases type wheel register lever. Spring tension moves type wheel register lever into engagement if a character is to be printed.
8. Print cam releases print hammer lever which allows spring to drive print hammer lever toward type wheel. Momentum of print hammer lever causes hammer to snap momentarily against bottom of message tape, driving the tape and inking ribbon against character on type wheel, printing the character on the message tape.
9. Type wheel register lever is withdrawn from the register wheel by register cam.
10. Print hammer lever is moved away from the type wheel by print cam.

11. Low portion on type wheel reciprocating cam allows spring to move type wheel to normal rear position.
12. Function shaft clutch is disengaged. Function shaft stops.

142. Tape Punching and Feeding Operations

In addition to printing messages on a paper tape (par. 141), the reperforator records the code impulses of each received code group in the form of punched holes in the message tape. The printing appears along one edge of the message tape, and the code impulses are recorded as holes across the message tape. This perforated portion of a message tape is subdivided into six columns; five for the code impulse holes and one for the tape feed hole. The first column along the edge opposite the printing is reserved for recording the first code impulse. When it is a marking impulse, a code hole is punched in this column, and when it is a spacing impulse, a hole is not punched. The second column is used to record the second code impulse in a like manner. The third column consists of a continuous row of smaller holes that are used for feeding the message tape through the reperforator. The remaining three columns are used for the third, fourth, and fifth code impulses. Start and stop impulses are not recorded in perforated form because the transmitter-distributor mechanism automatically provides these impulses. Operation of the mechanism that perforates the code and feed holes and feeds the tape is described in *a* through *c* below.

a. Code Hole Punching Selection. This operation begins when the code impulses of a received code group are stored in the code rings as described in paragraph 138. The lower end of each of the five code rings mates with one of five punch interference levers (fig. 116). These punch interference levers transfer the code-ring settings to the punching mechanism.

(1) When a code ring is positioned counterclockwise to record a spacing impulse, the mating punch interference lever is rotated clockwise. The lower arm moves away from the raised portion of its corresponding code hole punch lever and a hole will not be punched when the punching operation occurs.

(2) When a code ring is positioned clockwise to record a marking impulse, the mating punch interference lever rotates counterclockwise. This causes the lower arm of the punch interference lever to move in the blocking position directly above the raised portion of its code hole punch le-

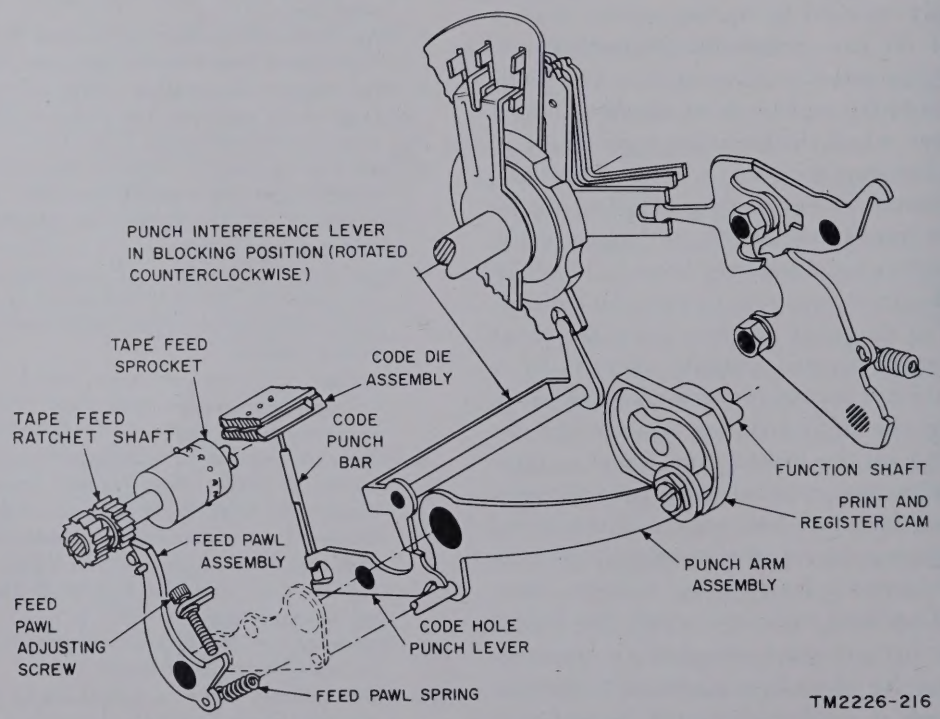


Figure 116. Functional diagram, selecting and punching mechanisms.

ver. When the punching operation occurs, a hole will be punched in the message tape to record this code impulse.

(3) The five code punch bars and the feed punch are mounted in the code die support and are held in place by a comb (fig. 117). Each of the code punch bars is engaged by an associated code hole punch lever. The feed punch bar is smaller in diameter than the code punch bars. The feed punch lever does not have a raised portion like the code hole punch levers, but is hooked around the shaft on the punch arm assembly. This arrangement causes the feed punch lever to raise the feed punch bar during the punching operation and perforate a feed hole in the message tape for each code group received.

b. Punching Operation. This operation occurs after the transfer operation positions the punch interference levers in accordance with the received code impulses. One-half revolution of the print and register cam, mounted on the function shaft (fig. 116), provides the power required for the punching operation. The cam starts ½ revolution when the transfer operation occurs. As the cam revolves, it moves the roller end of the punch arm assembly downward and causes the opposite end containing the five code hole punch levers to move upward toward the code punch bars. The code hole punch levers that are blocked by the lower arm of the mating punch interference levers push their respective punch bars upward through the paper tape to record marking code impulses. The code hole punch levers that are not blocked by the lower arm of the punch interference levers pivot counterclockwise slightly on their pivot stud and do not perforate the paper tape to record spacing code impulses.

c. Tape Feeding Operation. Tape feeding in this reperforator is accomplished by a slight rotation of the tape feed sprocket (fig. 118) as it feeds the tape one space for each code group received. The pins in the tape feed sprocket engage the feed holes in the message tape and force the message tape to move when the tape feed sprocket turns. Tape feeding occurs immediately before the message tape is punched.

(1) The initial motion for tape feeding is provided by the punch arm assembly when it begins the punching operation. As the

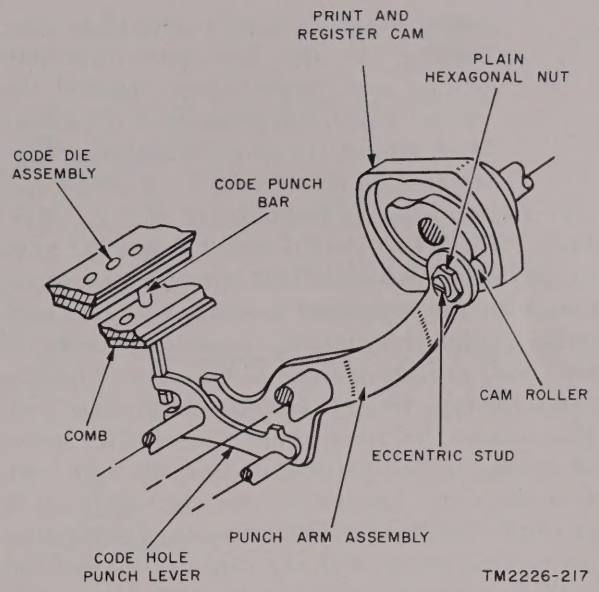


Figure 117. Basic punching mechanism.

code hole punch lever end of the punch arm assembly moves upward, the feed pawl assembly engages and rotates the ratchet wheel, feeding the tape. The feed pawl assembly must not be permitted to continue to turn the ratchet wheel during the purching operation, or the tape will be damaged. To prevent this, the machine screw on the code die support is adjusted to cause the feed pawl assembly to rotate free of the ratchet wheel immediately before the tape is punched.

(2) At all times, except during tape feeding, the tape feed sprocket is held motionless by the detent wheel, the detent lever, and a spring. The detent wheel is attached firmly to the shaft that contains the feed sprocket and ratchet wheel. The spring causes the detent lever to exert a constant pressure against the detent wheel. This

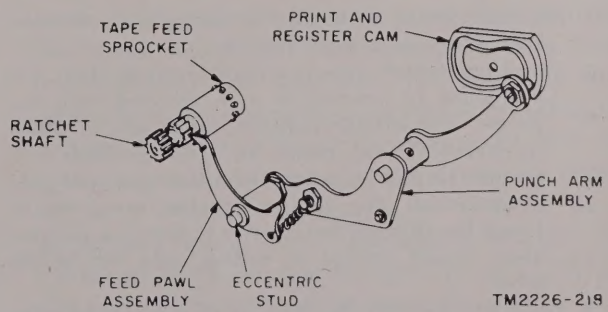


Figure 118. Basic tape feed mechanism.

pressure also is used to complete tape feeding. As the feed pawl assembly pushes and immediately releases the ratchet wheel, the pressure of the detent lever against the detent wheel completes the feeding operation.

d. Tape Puller (TT–107B/FG and TT–109/FG). The TT–707B/FG and TT–109/FG have a tape puller mechanism that operates in conjunction with the tape feed mechanism. The tape puller mechanism pulls the paper tape from the tape reel, providing slack in the paper tape between the tape feed mechanism and the tape reel. This relieves the tape feed mechanism of the strain of unwinding the paper tape from the tape reel. It consists of a tape puller arm (fig. 119) that is driven by the print and register cam, a tape puller spring that pivots with the arm to hold one end of the paper tape against the tape puller stud while the tape puller arm pulls it from the tape reel, and a tape puller bracket for mounting the mechanism.

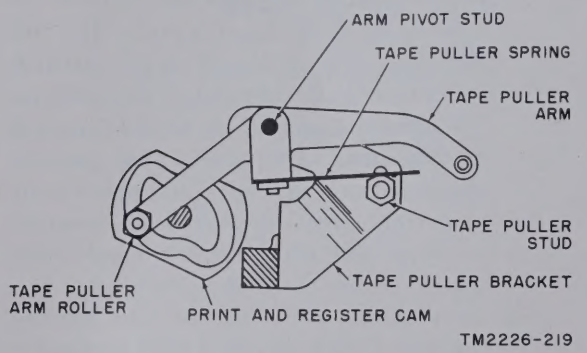


Figure 119. Tape puller mechanism (TT–107B/FG and TT–109/FG).

e. Summary. The following sequence chart summarizes the sequence of operations that occur during the tape punching and feeding operation.

Feeding and punching operation sequence chart

1. Sequence starts with transfer operation; function shaft starts to revolve (fig. 110).
2. Punch interference levers, actuated by code rings, are positioned in accordance with received code impulses. For spacing impulses, lower arm of punch interference lever moves to space position and swings clear of raised portion of mating code hole punch levers. For marking impulses, lower arm of punch interference lever moves to blocking position above raised portion of mating code hole punch levers.
3. Punch arm assembly begins to pivot, operated by print and register cam (fig. 116).
4. Feed pawl assembly engages ratchet wheel on tape feed sprocket shaft (fig. 118).
5. Paper tape is moved forward one character space. Detent lever and detent wheel hold paper tape stationary.
6. Tape puller arm and spring pivoted clockwise by print and register cam. Spring holds paper tape to tape puller stud as tape puller arm depresses paper tape, unreeling it (fig. 119).
7. Continued rotation of punch arm assembly forces code hole punch levers that are blocked by punch interference levers to drive code punch bars through paper tape. Other code punch bars remain in lower position. Feed punch lever drives feed punch through tape on every upward movement of punch arm assembly (fig. 117).
8. Print and register cam returns punch arm assembly to original position, withdrawing punches from paper tape (fig. 116).
9. Tape puller arm and spring pivoted counterclockwise, releasing tape (fig. 119).
10. Feed pawl assembly is positioned for the next feeding operation (fig. 116).
11. Function shaft clutch is disengaged. Function shaft stops.

143. Manual Tape Feed-Out Operation

A manually operated mechanism is included in the reperforator to permit feeding tape out of the reperforator while messages are not being received. To accomplish this, the operator merely operates the manual type feed-out lever (fig. 120) and releases it when sufficient tape has been fed. Operation of the manual tape feed-out lever positions the selector Y-levers for the blank code group (fig. 100) and trips the transfer lever. The printing mechanism prints the blank signal, and the tape feed mechanism feeds the tape. If a code group is received while the manual tape feed-out lever is operated, the motion of the selector camshaft disables the manual tape feed-out mechanism and the incoming message is recorded. Detailed operation of the manual tape feed-out mechanism (fig. 120) is described in *a* and *b* below. Manual tape feed-out is a local mechanical operation and has no effect on the signal line.

a. Tape Feed-out Operation. Operation of the manual tape feed-out lever to the left turns the feed-out control lever counterclockwise. This action raises the manual tape feed-out link that, in moving upward, raises one end of the feed-out latching lever (fig. 120). The feed-out latching lever, in moving upward moves against an eccentric stud that acts as a pivot point and causes the lever to pivot slightly. As it pivots, the end moving downward moves the feed-out operating

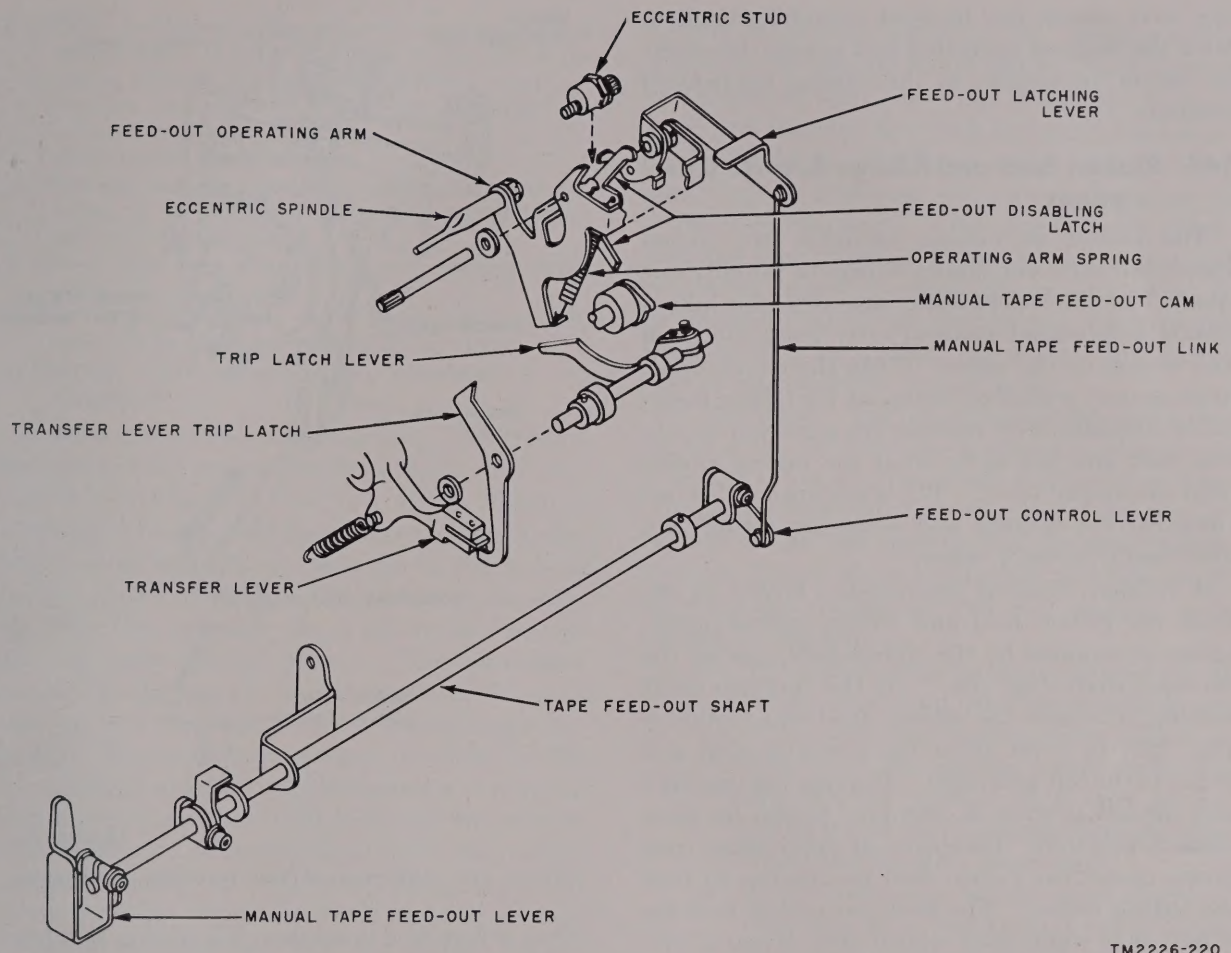


Figure 120. Manual tape feed-out mechanism.

arm downward against the trip latch lever. The trip latch lever rotates the transfer lever trip latch away from the transfer lever and permits the transfer lever spring to operate the transfer lever. An eccentric spindle, attached to the feed-out operating arm, extends over the upper arm of the selector Y-levers. As the feed-out operating arm moves downward, the eccentric spindle pushes downward on the Y-levers and rotates all five of them to the spacing position (blank code group position). With the release of the transfer lever, the transfer operation (par. 138) transfers the blank code group setting of the selector Y-levers to the code rings and punch interference levers. The transfer operation also causes the blank symbol to print and the tape to feed out. The entire operation is repeated continuously as long as the operator holds the manual tape feed-out lever in the operated position, unless an incoming code group disables the mechanism.

b. Effects of Received Code Group. If a code group is received during operation of the manual tape feed-out mechanism, the feed-out mechanism is disabled immediately by the receipt of the start impulse that causes the selector camshaft to rotate. The manual tape feed-out cam, mounted on the selector camshaft (fig. 104), trips the feed-out disabling latch, that was held in the latched position by the latch spring. When the feed-out disabling latch is tripped, the feed-out operating arm releases and the operating arm spring pulls the feed-out operating arm upward. The eccentric stud on the feed-out operating arm moves upward and releases the selector Y-levers. When the feed-out operating arm is in the upper position, the transfer lever trip latch engages the transfer lever again, and operation of the reperforator is controlled by the incoming code groups only. When this occurs, the operator releases the manual tape feed-out lever. The spring of the feed-out latch-

ing lever causes the feed-out disabling latch to latch the feed-out operating arm again; this resets the entire mechanism in the normal unoperated position.

144. Ribbon Feed and Ribbon Reverse Operations

The ribbon mechanism includes two ribbon spools and sufficient inking ribbon to fill only one spool. As the reperforator operates, the inking ribbon is unwound automatically from one spool and wound on the other. When the ribbon is almost entirely wound on one spool, the ribbon mechanism automatically reverses the direction of ribbon feed and begins to wind the inking ribbon onto the empty spool. The mechanisms that accomplish the feeding and reversing actions are described in *a* and *b* below.

a. Ribbon Feeding Operation. Power to operate the ribbon feed and ribbon reverse mechanism is supplied by the ribbon feed cam on the function shaft (fig. 104). As the function shaft rotates, it causes the ribbon feed cam follower (fig. 121) to pivot about the eccentric stud and swing to the left and right. The cam has one high and one low portion as compared to two for most cams in this unit. Reception of every other code group causes the ribbon feed mechanism to feed the inking ribbon. The feed mechanism includes a left- and right-hand ribbon feed lever, a left- and right-hand ribbon feeding detent wheel, and a left- and right-hand sensing lever, one of each for each ribbon spool. The two ribbon feed levers are mounted on a U-shaped driving link lever that is coupled to the ribbon feed cam follower. As the ribbon feed cam follower pivots to the left, it moves the driving link lever upward. One ribbon feed lever engages its ribbon feeding detent wheel and rotates the ribbon spool shaft enough to feed the inking ribbon one character space. On the downward stroke of the ribbon feed cam follower, the ribbon feed lever also is moved downward in preparation for the next feed stroke. The other ribbon feed lever moves up and down also but is held away from its mating ribbon feeding detent wheel. A ratchet feed detent and spring prevents the driven ribbon feeding detent wheel from rotating freely.

b. Ribbon Feed Sequence. Assume that the function shaft (fig. 104) is in that portion of its cycle so that the ribbon feed cam follower (fig. 121) is moved to the right just prior to the start

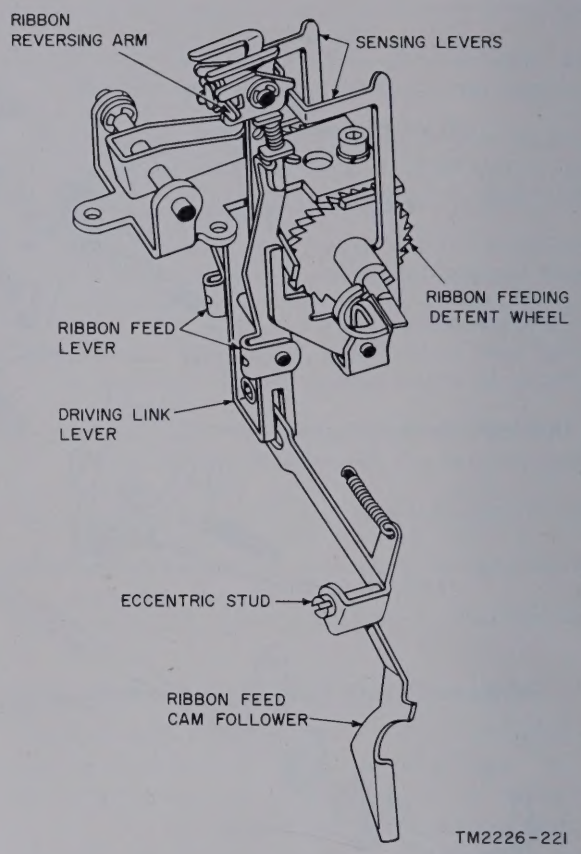


Figure 121. Ribbon feed and reversing mechanism.

of the ribbon feed operation, the driving link lever and the ribbon feed levers are in their down positions. The driving ribbon feed lever is positioned to engage its ribbon feeding detent wheel. The driven ribbon feeding detent wheel is engaged by its detent to prevent reverse rotation of the detent wheel. The ribbon feed lever and the ratchet feed detent associated with the idling ribbon feeding detent wheel are held out of engagement with the detent wheel by the ribbon reversing arm to prevent any engagement with the ribbon feeding detent wheel. The following chart summarizes the sequence of operations of the ribbon feed mechanism as the function shaft starts to rotate.

Ribbon feed sequence chart

1. Function shaft starts to rotate.
2. Print and register cam moves the ribbon feed cam follower to the left, moving the driving link lever and ribbon feed lever upward.
3. Ribbon feed lever engages one of the ribbon feeding detent wheels that drives one of the ribbon spools.
4. Inking ribbon moves one space, unwinding the inking ribbon from the opposite ribbon spool.

5. Ratchet feed detent engages the driven ribbon feeding detent wheel to prevent reverse movement of the ribbon feeding detent wheel and ribbon spool.
6. Function shaft stops until it is again actuated by a received code group.
7. Function shaft starts to rotate.
8. Print and register cam moves ribbon feed cam follower to the right, moving the driving link lever and ribbon feed lever.
9. Ribbon feed lever disengages ribbon feeding detent wheel.
10. Print and register cam moves ribbon feed cam follower to the extreme right position.
11. Function shaft stops, having completed 1 full revolution.

c. Ribbon Reversing Mechanism. The ribbon feed mechanism automatically reverses the direction of feed when the last turn of the ribbon is unwrapped from one of the ribbon spools. As the ribbon spool empties, an opening in the hub of the spool is uncovered and the portion of the sensing lever that is inside the spool moves into the opening under spring tension. This movement pivots the top end of the sensing lever forward into the vertical path of the reversing toggle assembly. On the next downward movement of the cam follower arm, the toggle assembly is tripped. This moves the ribbon feed lever and the ratchet feed detent out of engagement with the ribbon feeding detent wheel of the full ribbon spool, and moves the other ribbon feed lever and ratchet feed detent into engagement with the ribbon feeding detent wheel of the empty ribbon spool. As the reperforator continues to operate, the ribbon feed lever engages the ribbon feeding detent wheel associated with the empty ribbon spool and rotates the ribbon spool to wind the inking ribbon onto it. The ribbon reversing action occurs automatically on each side as each ribbon spool, in turn, becomes empty.

145. Stop Bar Selection of Functions

In addition to recording messages in printed and punched form on tape, the reperforator is capable of performing three mechanical operations called the letters shift function, the figures shift function, and the signal bell function.

a. General. A stop bar for each function is located in the code-ring cage (fig. 112). The signal bell function shares the same stop bar used for selecting the letter S. The stop bars for these functions extend beyond the other bars at the rear of the code-ring cage. Three sensing levers, one for each function, are mounted on the stop arm shaft directly behind the code-ring cage. Springs apply tension to the sensing levers and pull each toward its respective stop bar. Operation of the type wheel and function lever cam and cam lever assembly holds the sensing levers away from the stop bars while an incoming code group is being set up in the code-ring cage. After the transfer operation, the type wheel and function lever cam and cam lever assembly permit the sensing levers to be pulled toward their stop bars. Each of the function stop bars, when not selected, blocks the path of its respective sensing lever.

b. Operation. The function sensing operation begins after the transfer operation positions the code rings. As the type wheel and function lever cam on the function shaft begins to rotate, a low portion of the cam permits the cam lever assembly (fig. 122) to move toward the function shaft, allowing the springs to pull each sensing lever toward its stop bar.

(1) If the code rings have not selected one of the function stop bars, the sensing levers rotate until each sensing lever strikes its stop bar. The sensing levers remain in this blocked position until they are restored by the cam lever assembly and type wheel and function lever cam.

(2) If the code rings select one of the function stop bars, the three sensing levers move toward their stop bars until the two not selected are halted by their stop bars. The selected stop bar is not in position to block the sensing lever of the desired function, and the sensing lever rotates past the stop bar causing operation of the associated function mecha-

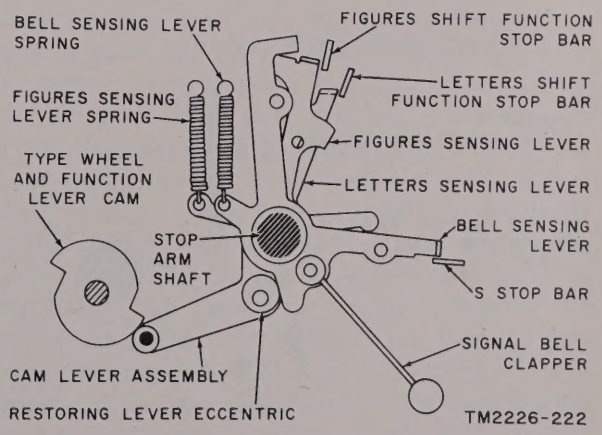


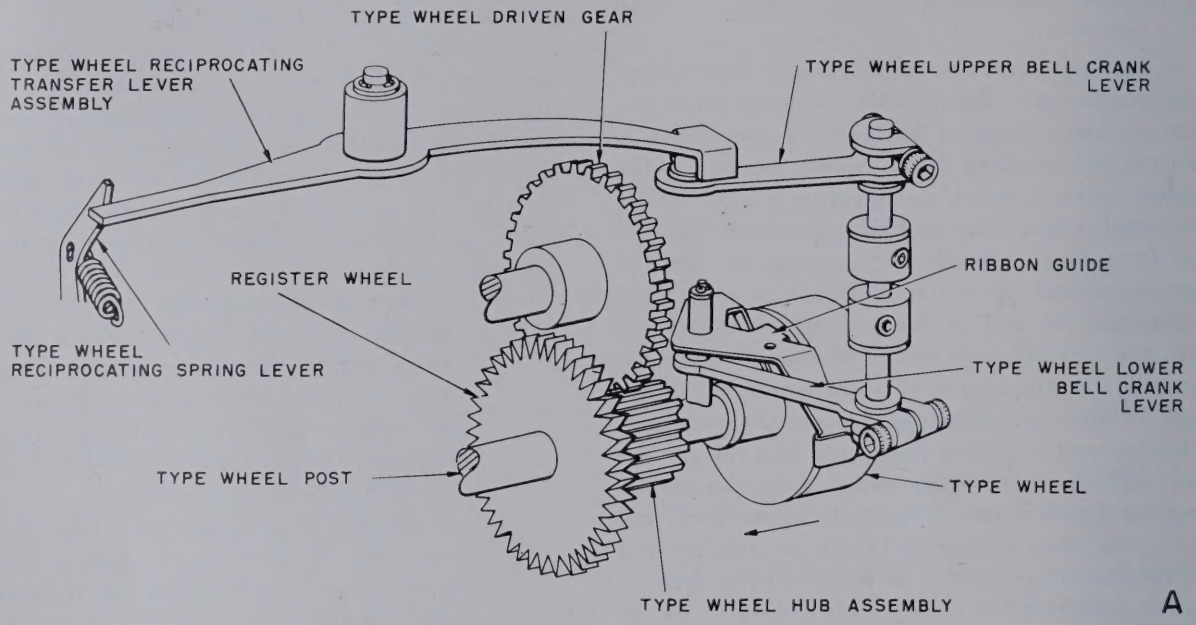
Figure 122. Function sensing levers in normal (blocked) position.

nism. When a function stop bar is in the selected position, the front end moves into the notch formed by the code rings and raises the rear extension of the stop bar out of the path of its sensing lever.

146. Letters Shift and Figures Shift Operations

The type wheel of the reperforator is moved to the forward position directly above the message tape for printing, and is moved backward after printing to expose the character to view. This forward and backward movement of the type wheel is called type wheel reciprocation. It works in conjunction with the figures shift and letters shift mechanisms that control the length of the type wheel reciprocating stroke.

a. Power to move the type wheel is supplied by the type wheel and function lever cam (B, fig. 123) on the function shaft, that begins to rotate after the transfer operation. As the type wheel



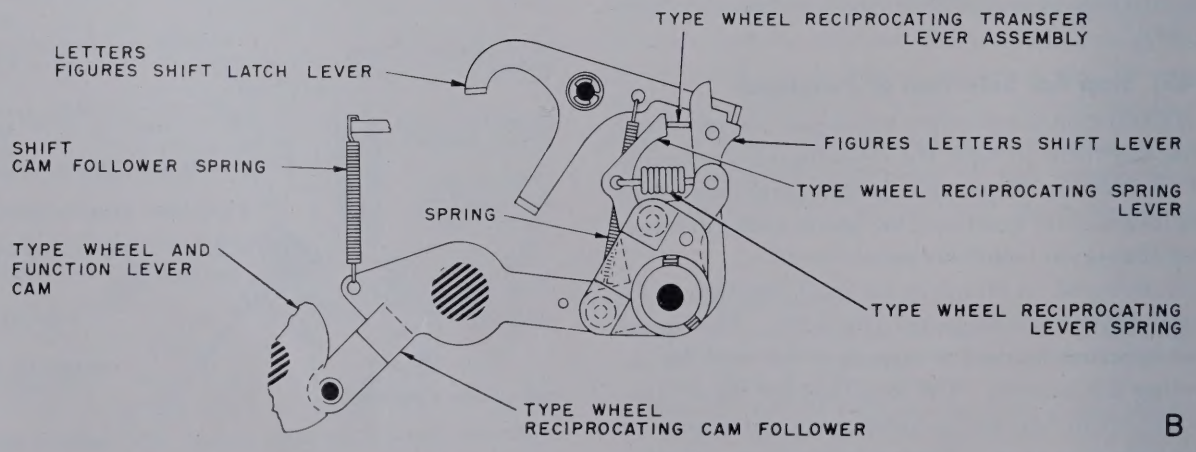

TYPE WHEEL RECIPROCATING TRANSFER LEVER ASSEMBLY
LETTERS FIGURES SHIFT LATCH LEVER
FIGURES LETTERS SHIFT LEVER
SHIFT CAM FOLLOWER SPRING
TYPE WHEEL RECIPROCATING SPRING LEVER
SPRING
TYPE WHEEL AND FUNCTION LEVER CAM
TYPE WHEEL RECIPROCATING LEVER SPRING
TYPE WHEEL RECIPROCATING CAM FOLLOWER
B

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Figure 123. Type wheel reciprocating and shifting mechanism.

and function lever cam rotates, its high portion pushes one arm of the type wheel reciprocating cam follower downward. This moves the opposite arm, that is coupled to the type wheel reciprocating spring lever upward, rotating the type wheel reciprocating spring lever clockwise when viewing it from the rear. When the type wheel reciprocating spring lever rotates, it pivots the type wheel reciprocating transfer lever assembly (A, fig. 123), rotating the bell crank levers. This projects the type wheel forward above the paper tape just before the printing operation occurs. The inking ribbon, attached to the type wheel assembly reciprocates forward with the type wheel. As the type wheel and function lever cam continues to rotate after printing, the low portion of the cam permits the spring to return the cam lever assembly to its original position. The type wheel, moved by spring tension, returns to its normal position behind the printed portion of the paper tape, permitting the operator to read the last printed character.

b. Just prior to the operation of the type wheel reciprocating mechanism, the type wheel (fig. 123) is in the rearward position withdrawn from the printing so that the last character printed is visible to the operator. The type wheel reciprocating transfer lever assembly is pivoted clockwise. The type wheel reciprocating cam follower is also pivoted clockwise and its roller is in the low portion of its associated cam. The following chart summarizes the sequence of operations that occur when the function shaft starts to rotate and the type wheel reciprocating mechanism operates.

Type wheel reciprocating operation sequence chart

1. Function shaft starts to rotate.
2. Type wheel and function lever cam on the function shaft moves against the type wheel reciprocating cam follower, pivoting the type wheel reciprocating cam follower counterclockwise (fig. 123).
3. Type wheel reciprocating cam follower pivots type wheel reciprocating spring lever clockwise, moving the lever against the type wheel reciprocating transfer lever assembly.
4. Type wheel reciprocating transfer lever assembly pivots counterclockwise on its stud, pivoting the type wheel upper bell crank lever in a clockwise direction.
5. Clockwise rotation of the type wheel upper bell crank lever is transferred to the type wheel lower bell crank lever that moves the type wheel outward.
6. Driven end of the type wheel reciprocating transfer lever strikes the figures-letters shift lever that limits the type wheel reciprocating transfer lever travel. (Travel distance varies depending upon whether the figures-letters shift lever is in the letters or figures position.)
7. Type wheel reciprocating spring lever continues its clockwise motion, extending its spring.
8. Type wheel reciprocating cam follower reaches high point of the type wheel and function lever cam.
9. Print hammer lever strikes paper tape (par. 141) printing alined character.
10. Type wheel reciprocating cam follower moves to low point of type wheel and function lever cam under tension of the shift cam follower spring, pivoting the type wheel reciprocating cam follower clockwise, to the restored position.
11. Type wheel reciprocating cam follower pivots the type wheel reciprocating spring lever counterclockwise, moving the lever out of engagement with the type wheel reciprocating transfer lever assembly.
12. Type wheel bell crank lever spring on the type wheel lower bell crank lever pivots the bell crank assemby counterclockwise, moving the type wheel reciprocating transfer lever assembly and the type wheel to the restored position.

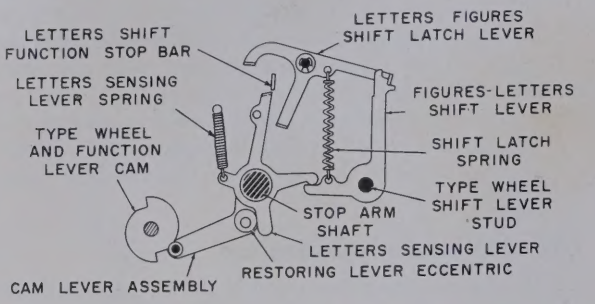
147. Letters Shift Operation

The characters and symbols printed by this reperforator are arranged in two raised parallel rows around the type wheel. The letters (outer) row contains the letters of the alphabet and three special symbols shown in the LTRS column (fig. 100. The figures (inner) row contains the numbers, punctuation marks, and symbols shown in the FIGS column. When the reperforator is in the letters shift position, the type wheel reciprocates forward just enough to aline the letters row of characters above the print hammer lever. When the reperforator is in the figures shift position, the reciprocating stroke is longer and the figures row is alined with the print hammer lever.

a. When a letters shift code group is received, the code rings are positioned to select the letters shift function stop bar (fig. 122). The letters sensing lever (A, fig. 124), no longer blocked by the letters shift function stop bar, is rotated by the letters sensing lever spring. The arm opposite the spring engages the figures-letters shift lever and rotates it counterclockwise to the letters shift position. This action permits a spring to pull the letters-figures shift latch lever downward, thereby latching the figures-letters shift lever in the letters shift position. In this position, the figures-letters shift lever limits the forward motion of the type wheel (B, fig. 123) during reciprocation. The type wheel is moved forward during reciprocation as the type wheel reciprocating spring lever rotates the free end of the type wheel

reciprocating transfer lever assembly. When the free end of the type wheel reciprocating transfer lever assembly strikes the figures-letters shift lever, forward motion of the type wheel is halted and the letters-row of characters on the type wheel is positioned above the print hammer lever.

b. The letters shift operating sequence starts as the letters code group is set up in the code-ring cage by the transfer operation (fig. 109). Just prior to this, the letters shift function stop bar (A, fig. 124) is in the path of the letters sensing



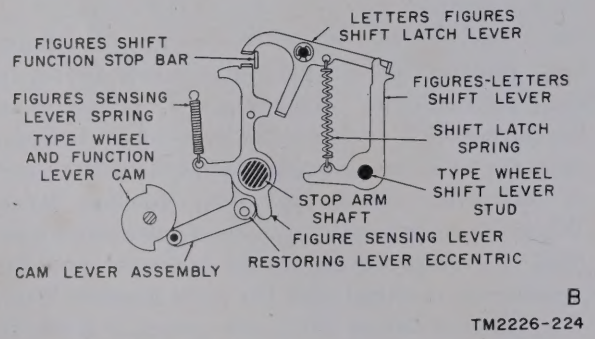


Figure 124. Figures and letters shift mechanism.

lever. The letters figures shift latch lever holds the figures-letters shift lever clockwise in its figures position. The cam lever assembly is at the high point of its associated cam and holds the sensing levers in their restored position. Following is a chart that summarizes the sequence of operations that occur when the reperforator is shifted from the figures shift to the letters shift position.

Letters shift sequence chart

1. Letters code group received and set up by code rings in the code-ring cage.
2. Letters shift function stop bar pivoted into alined notches in code rings, moving rear end of the stop bars out of the path of the letters sensing lever.
3. Function shaft starts to rotate, high part of type wheel and function lever cam moves out of the path of the cam lever assembly.
4. Letters sensing lever spring pivots letters sensing lever clockwise into contact with lower extension of the figures-letters shift lever.
5. Figures-letters shift lever pivots counterclockwise.
6. Shift latch spring pulls letters figures shift latch lever to lower latch surface on the figures-letters shift lever, locking the lever in the letters shift position.
7. Type wheel reciprocating transfer lever assembly strikes figures-letters shift lever, restricting its travel distance (*a* above).
8. Type wheel and function lever cam on function shaft moves against the cam lever assembly, moving the cam lever assembly and the letters sensing lever to the restored position.
9. Figures-letters shift lever remains latched in the letters position.
10. Function shaft stops rotating.

148. Figures Shift Operation

Operation of the figures shift mechanism permits a long forward stroke of the type wheel during reciprocation that permits the figures now on the type wheel to print.

a. Reception of the figures code group causes selection of the figures shift function stop bar in the code-ring cage (fig. 112). Since the figure sensing lever (B, fig. 124) is not stopped by its figures shift function stop bar, the figures sensing lever spring rotates the figures sensing lever, causing it to trip the letters-figures shift lever latch. When tripped, the letters figures shift lever latch moves upward and releases the figures-letter shift lever, which is pulled to the figures shift position by its spring. In this position, the figures-letters shift increases the distance the type wheel reciprocating transfer lever assembly (fig. 123) can travel during reciprocation, thereby increasing the forward motion of the type wheel. When the figures-letters shift lever is in the figures shift position, the forward motion of the type wheel is not halted until the figures (inner) row of the type wheel is directly over the print hammer lever. As the operation of the reperforator continues, the figures or symbols in this row are printed until a letters shift code group is received.

b. The figures shift operation sequence starts as the figures code group is set up in the code-ring cage by the transfer operation (fig. 109). Just prior to this, the figures shift function stop bar is in the path of the figures sensing lever. The letters figures shift latch lever (B, fig. 124) holds the figures-letters shift lever counterclockwise in

the figures position. The cam lever assembly is at the high point of its associated cam and holds the sensing levers in their restored position. Following is a chart that summarizes the sequence of operations that occur when the reperforator is shifted from the letters shift to the figures shift position.

Figures shift sequence chart

1. Figures code group received and set up by code rings in the code-ring cage.
2. Figures shift function stop bar pivoted into the alined notches in the code rings, moving the rear end of the stop bar out of the path of the figures sensing lever.
3. Function shaft starts to rotate, high part of type wheel and function lever cam moves out of the path of the cam lever assembly.
4. Figures sensing lever spring pivots the sensing lever clockwise into contact with lower extension of the letters-figures shift latch lever (B, fig. 124).
5. Figures-letters shift latch lever pivots counterclockwise far enough to unlatch the figures-letters shift lever (fig. 124).
6. Shift latch spring pivots the figures-letters shift lever clockwise until latched in the figures shift position by the letters-figures shift latch lever.
7. Type wheel reciprocating transfer lever strikes figures-letters shift lever latched in the figures position, restricting its travel distance (*a* above).
8. Type wheel and function lever cam on function shaft moves against the cam lever assembly, moving the cam lever assembly and the figures sensing lever to the restored position.
9. Figures-letters shift lever remains latched in the figures position.
10. Function shaft stops rotating.

149. Signal Bell Operation

This reperforator includes a signal bell mechanism that is used by operators for signaling purposes. The signal bell rings each time the S code group is received while the shift mechanism is in the figures shift position. The code group also is recorded in punched form on the tape, and the bell symbol (fig. 100) is printed. Reception of the same code group causes the letter S to be printed when the shift mechanism is in the letters shift position.

a. Operation. The signal bell mechanism (fig. 125) rings the bell whenever the bell sensing lever spring is permitted to rotate the bell sensing lever clockwise (as viewed from the rear), causing the signal bell clapper to strike the signal bell. The bell function stop bar (used for the letter S also) normally blocks rotation of the bell sensing lever when other code groups are received. Reception of the S code group causes the code rings to select the bell function stop bar. The stop bar then moves out of the path of the bell sensing lever and permits the bell sensing lever to rotate when the shift mechanism is in the figures shift position. The sensing lever when pivoted by the sensing lever spring strikes the signal bell clapper against the signal bell. The mechanism is reset when the cam lever assembly moves to the high point of its associated cam restoring the function sensing levers to the original counterclockwise position.

b. Signal Bell Suppression in Letters Shift. Although the same code group is used both for printing the letter S and ringing the signal bell, only one is accomplished when this code group is received. The upper extension of the bell sensing lever is blocked by the upper arm of the letters figures shift latch lever (fig. 125) when the code group is received while the shift mechanism is in the letters shift position. When this occurs, the reperforator prints the letter S and punches the code in the paper tape. If the code group is received while the reperforator is in the figures shift position, the upper arm of the letters-figures shift catch lever is positioned below the upper extension of the bell sensing lever and does not block rotation of the sensing lever. In this condition, the signal bell rings, the bell code is punched in the paper tape, and the type wheel reciprocates forward far enough to print the bell symbol (figures row) on the type wheel.

c. Signal Bell Operating Sequence. The signal bell operating sequence starts when the S code group is received and set up in the code-ring cage.

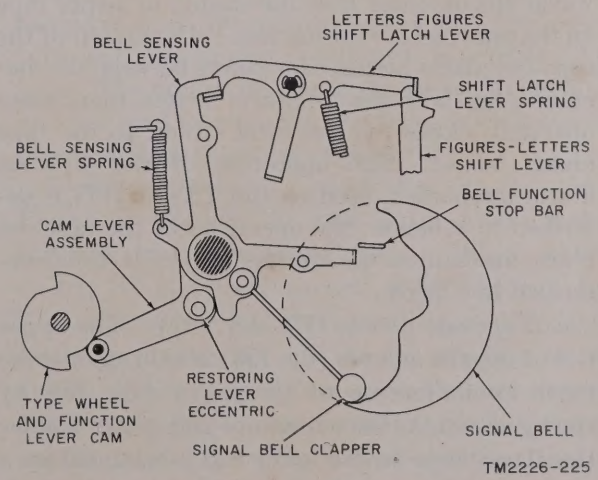


Figure 125. Signal bell mechanism in operated condition.

Just prior to the start of the sequence, the cam lever assembly is at the high point of its associated cam, holding the bell sensing lever (fig. 125) and its assembled signal bell clapper in the restored position. The figures-letters shift lever is held in the figures (clockwise) position by the letters figures shift latch lever. In the figures position, the left arm of the letters figures shift latch lever is pivoted out of the path of the upper arm of the bell sensing lever. The bell function stop bar remains in the path of the lower arm of the bell sensing lever until the S code group is received in the code-ring cage. The following chart summarizes the sequence of signal bell operations.

Signal bell sequence chart

1. S code group received and set up by the code rings in the code-ring cage.
2. S stop bar pivots into the alined notches in the code rings, moving the rear end of the bell function stop bar out of the path of the bell sensing lever.
3. Function shaft starts to rotate, high part of type wheel and function lever cam moves out of the path of the cam lever assembly.
4. Cam lever assembly pivots sharply clockwise, releasing the function sensing levers.
5. Bell sensing lever spring pivots the bell sensing lever and its assembled signal bell clapper clockwise, causing the signal bell clapper to strike the signal bell.
6. Type wheel and function lever cam on function shaft moves against the cam lever assembly, moving the cam lever assembly and the bell sensing lever to the restored position.
7. Function shaft stops rotating.

150. Tape-Out Alarm

Both the TT–107/FG and the TT–107B/FG are provided with a tape-out alarm mechanism that warns the operator that the supply of paper tape on the tape reel is running low. The design of the tape-out alarm mechanism differs between the machines, but both use an alarm switch that, when operated, closes the electrical circuit to the tape alarm buzzer. The operation of the tape-out alarm mechanism used on the TT–107/FG is described in *a* below; the operation of the tape-out alarm mechanism used on the TT–107B/FG is described in *b* below.

a. Tape-out Alarm (TT–107/FG). The upper end of the alarm lever (fig. 126) is held against the outer circumference of the paper tape roll by spring action. As the paper tape roll grows smaller the alarm lever whose lower end is mounted on a stud on the tape reel bracket, pivots counterclockwise. The switch actuating stud, mounted near

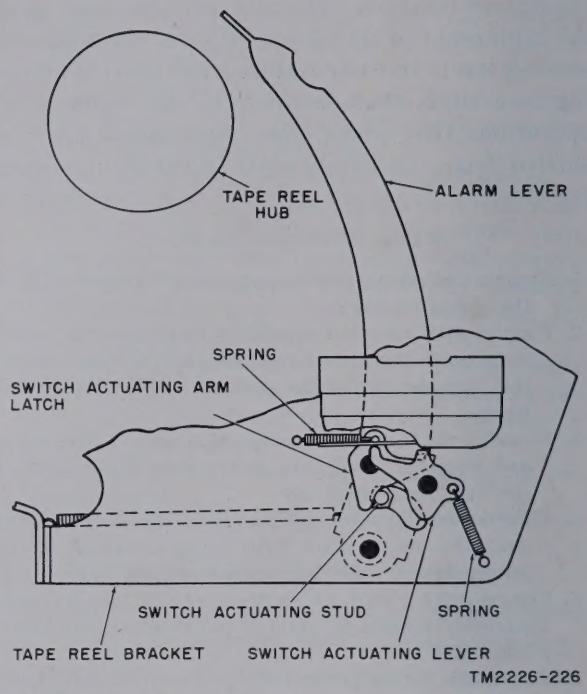


Figure 126. Tape-out alarm mechanism (TT–107/FG).

the lower end of the alarm lever and extending through a hole in the tape reel bracket, moves against the switch actuating arm latch as the paper tape roll diameter diminishes. This action pivots the switch actuating arm latch clockwise and unlatches the switch actuating lever (pivoted clockwise by its spring). The extended arm of the switch actuating lever strikes the operating lever of the alarm switch and closes the alarm switch. When the alarm switch closes, it energizes the circuit to the tape alarm buzzer to sound the alarm. This triggering arrangement causes the switch to snap to the closed position to prevent arcing that could result if the switch was closed slowly. The tape-out alarm mechanism is reset when the alarm lever is pivoted clockwise to install a new paper tape roll. This moves the switch actuating stud against the switch actuating lever, pivoting it counterclockwise so that it can be latched by the switch actuating arm latch. The following tape-out alarm sequence chart summarizes the operation of the mechanism, if the mechanism is reset as described above.

Tape-out alarm sequence chart (TT–107/FG)

1. Switch actuating arm latch spring pivots the switch actuating arm latch counterclockwise, causing it to latch the switch actuating lever.

2. As the tape roll is expended, the alarm lever pivots counterclockwise, moving the switch actuating stud against the switch actuating arm latch.
3. Switch actuating arm latch pivots clockwise, unlatching the switch actuating lever.
4. Switch actuating lever spring pivots the switch actuating lever counterclockwise.
5. Arm on the switch actuating lever snaps against the alarm switch operating lever to close the alarm switch.
6. Closed alarm switch permits the flow of current to the tape alarm buzzer, sounding the alarm.
7. When a new tape roll is installed, the alarm lever is pivoted to the right, causing the switch actuating stud to strike the switch actuating lever, pivoting it counterclockwise to open the alarm switch.

b. Tape-out Alarm (TT–107B/FG). The free end of the alarm lever (fig. 127) is held against the outer circumference of the paper tape roll by spring action. As the paper tape roll diameter diminishes, the tape alarm lever pivots counterclockwise on its stud. The switch arm assembly is fastened to, and pivots with, the tape alarm lever. As the free end of the alarm lever approaches the core in the center of the paper tape roll, the switch arm assembly, whose notch engages the operating lever of the alarm switch, moves the switch operating lever downward to close the alarm switch. When the alarm switch closes, it energizes the electrical circuit to the tape alarm buzzer to sound the alarm. The switch operating lever that is an integral part of the alarm switch, terminates with a spring and gives the switch operating lever some flexibility. This permits the switch to snap to the closed position to prevent internal arcing which occurs when the switch is closed slowly. A lever latch mounted on the switch arm assembly engages a stud on the switch bracket when the alarm lever is moved to the extreme clockwise position. The lever latch holds the alarm lever in this position while the new paper tape roll is being installed. With the alarm lever in this position, the switch operating lever is up and the circuit to the tape alarm buzzer is open. When it is manually pivoted counterclockwise, the lever latch releases the alarm lever, permitting spring action to move the free end of the alarm lever against the tape roll.

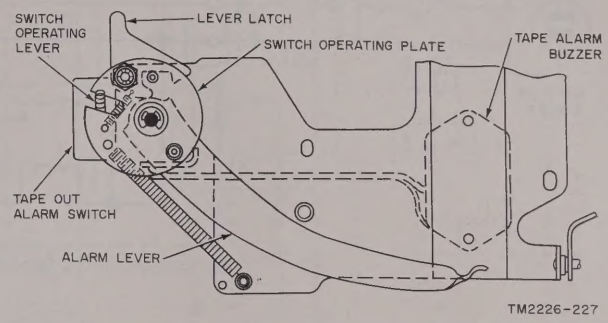


Figure 127. Tape-out alarm mechanism (TT–107B/FG)

Section IV. CIRCUIT DESCRIPTIONS

151. General

The circuits in the reperforator are divided into two main groups: ac and dc circuits. The complete schematic diagrams for the TT–107/FG and the TT–107B/FG are illustrated separately. The circuit for the series-governed motor of the TT–109/FG is included with the complete schematic diagram of the TT–107B/FG; the remainder of the TT–107B/FG and the TT–109/FG circuitry is identical. Figure 128 illustrates the synchronous and series-governed motor circuits. Figures 129 and 130 are the complete schematic diagrams and figures 131, 132, and 133 are the airline wiring diagrams of the reperforators.

152. Ac Circuits

a. Motor Circuit TT–107/FG (A, fig. 128). Power is applied to the synchronous motor through two 1.6-ampere fuses. When power switch S1 is closed, current flows through the run and start windings. Capacitor C2, in series with the start winding, shifts the phase of the current through the start winding and provides the initial torque to start the armature rotating. The armature continues to gain speed until it reaches 3,600 rpm. The circuit begins at the power input plug and is traced through the two fuses, power switch, phase shifting capacitor, and motor.

b. Motor Circuit TT–107B/FG (B, fig. 128). Power is applied to the synchronous motor through two 1.6-ampere fuses. When power switch S4 is closed, current flows through the 3.75-μf capacitor and start winding, and through motor start relay K1 and the run winding of the motor. When relay K1 energizes, it closes its contact and places a 10-ohm resistor and a 5-μf capacitor in parallel with the 3.75-μf capacitor that is in series with the start winding. This increases the effective capacity in series with the start wind-

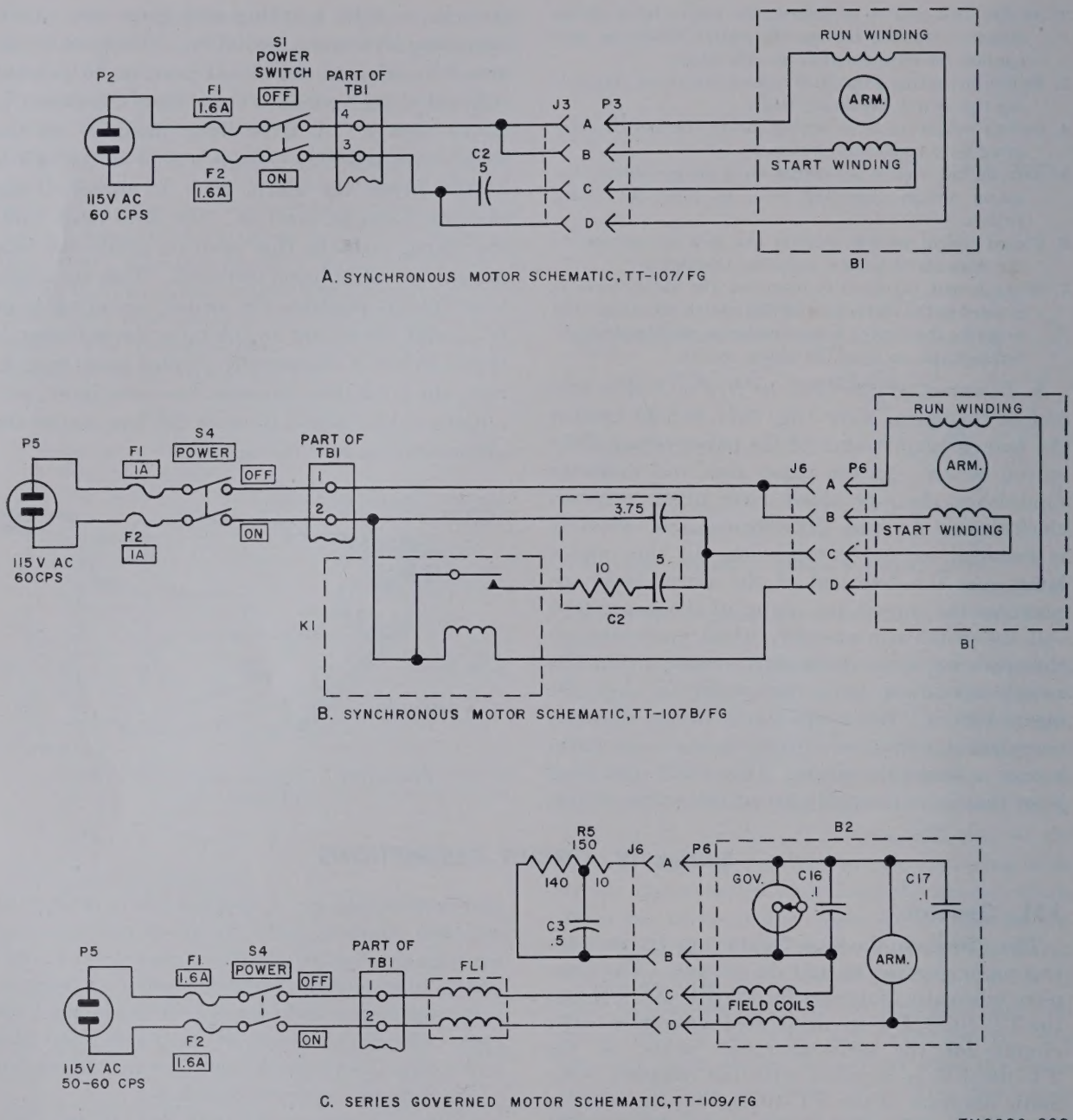


Figure 128. Motor circuits, simplified schematic diagram.

ing and provides the initial torque to start the armature rotating. As the armature gains speed, the current that flows through the motor (and also the relay coil) decreases. When a predetermined current value is reached, relay K1 denergizes and its contact opens. The start winding circuit remains completed through the 3.75-μf capacitor. The motor armature continues to accelerate until it reaches 3,600 rpm. The motor is wired so that the motor armature rotates clockwise when viewed from the blower wheel end.

c. Motor Circuit TT–109/FG (C, fig. 128). Power is applied to the series-governed motor through the power input cord and two 1.6-ampere fuses. When power switch S4 is closed, current flows through filter FL1, the field coils, armature, and governor assembly and causes the motor armature to rotate. The motor speed is controlled by

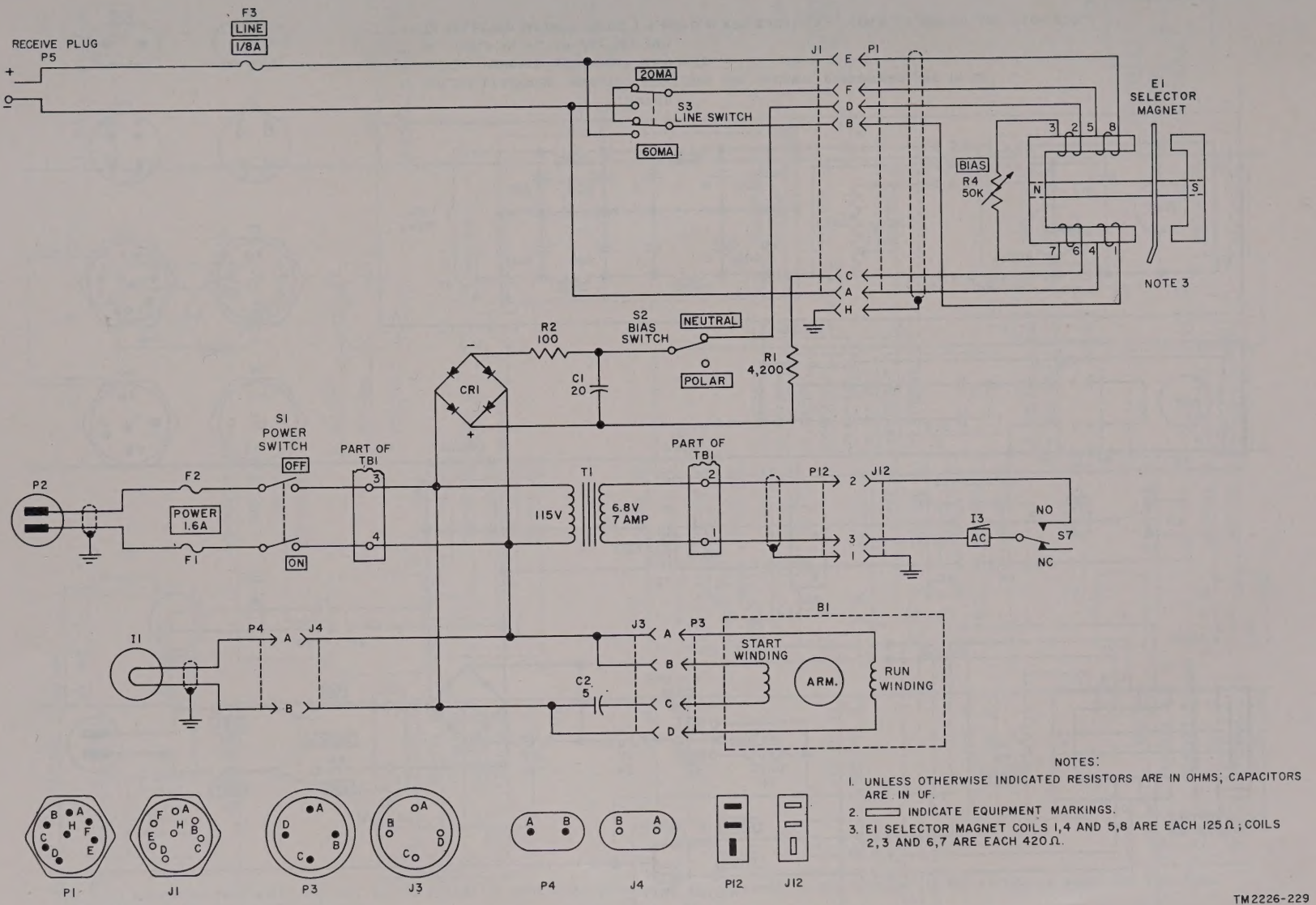
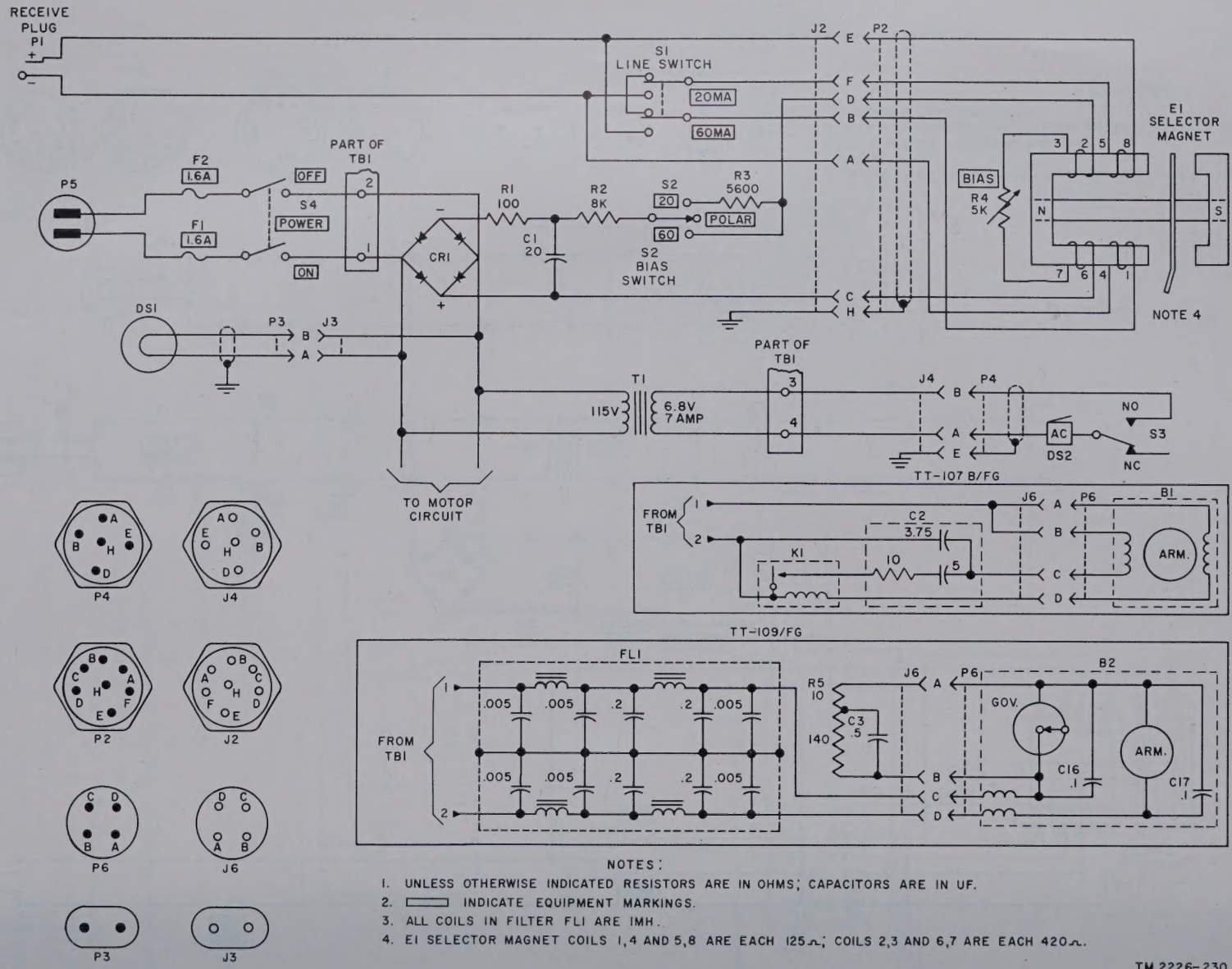


Figure 129. Teletypewriter Reperforator TT-107/FG, schematic diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED RESISTORS ARE IN OHMS; CAPACITORS ARE IN UF.
2. ▭ INDICATE EQUIPMENT MARKINGS.
3. ALL COILS IN FILTER FL1 ARE 1MH.
4. EI SELECTOR MAGNET COILS 1,4 AND 5,8 ARE EACH 125Ω; COILS 2,3 AND 6,7 ARE EACH 420Ω.

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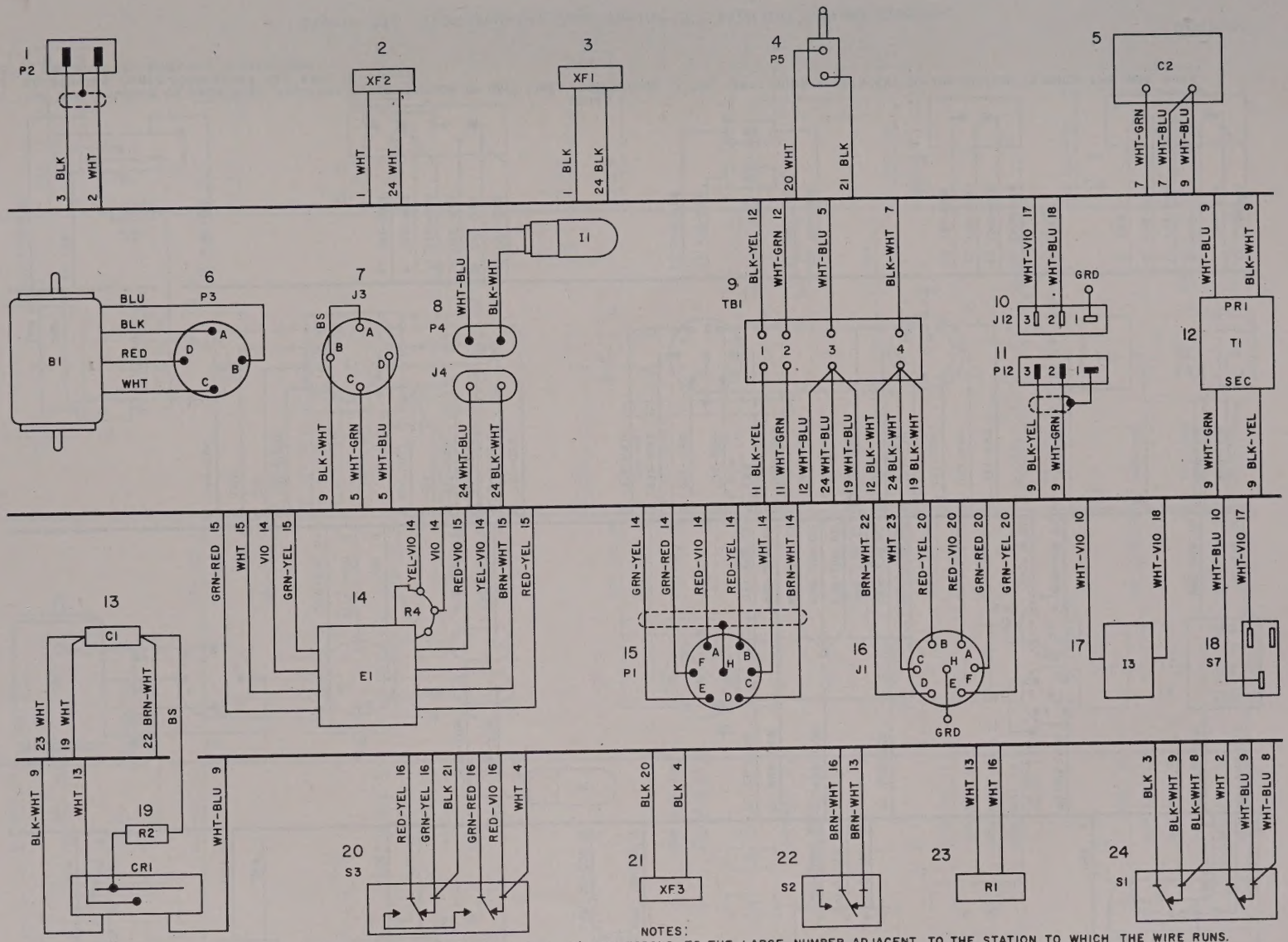
Figure 130. Teletypewriter Reperforators TT-107B/FG and TT-109/FG, schematic diagram.



NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPOND TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. BS DENOTES TINNED COPPER PER ASA H44.
3. ⊏⊐▶ DENOTES SHIELDED CONNECTIONS.

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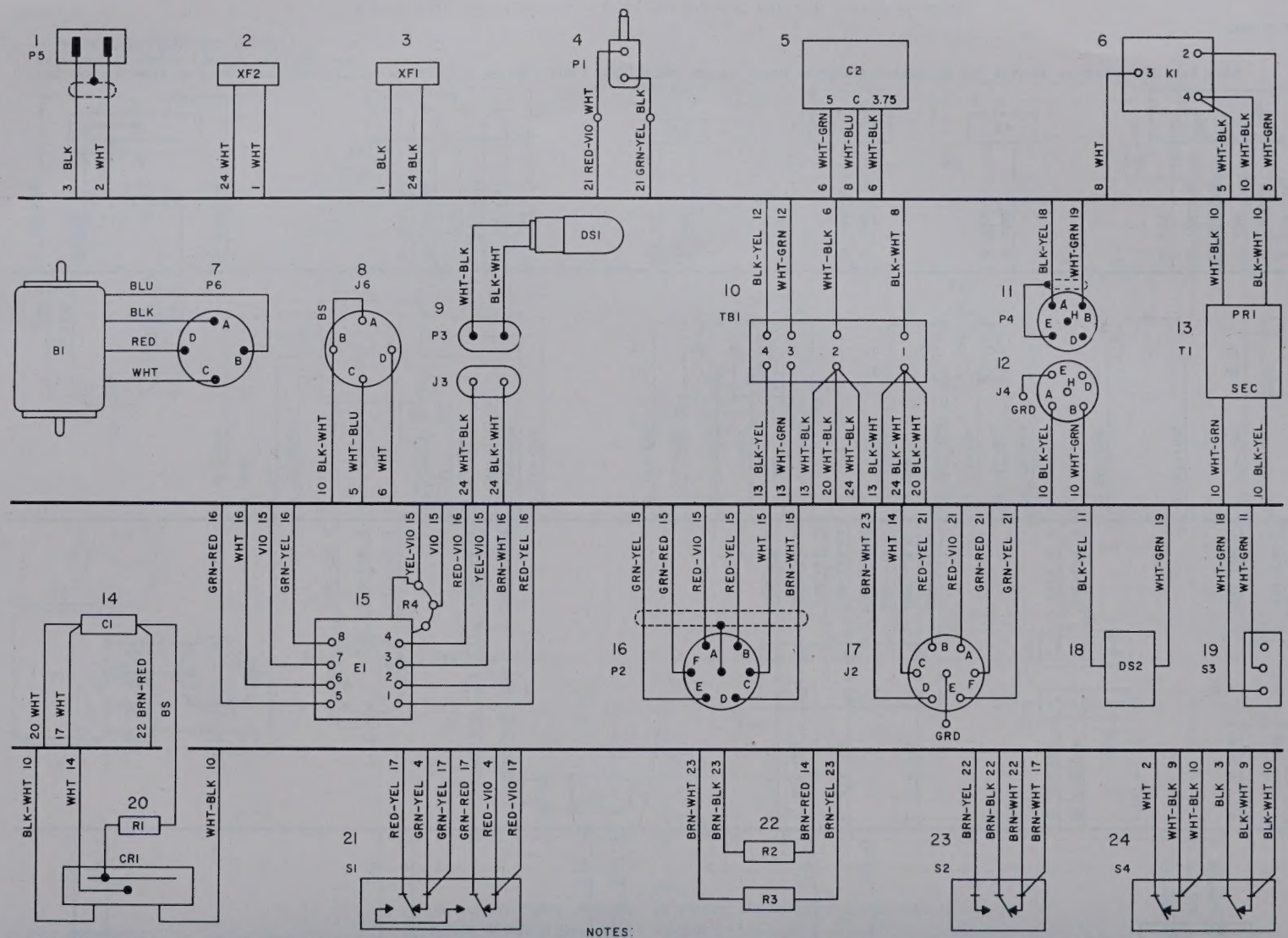
Figure 131. Teletypewriter Reperforator TT-107/FG, wiring diagram.



NOTES:
1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. BS DENOTES TINNED COPPER PER ASA H44.
3. ⊂⊃ DENOTES SHIELDED CONNECTIONS.

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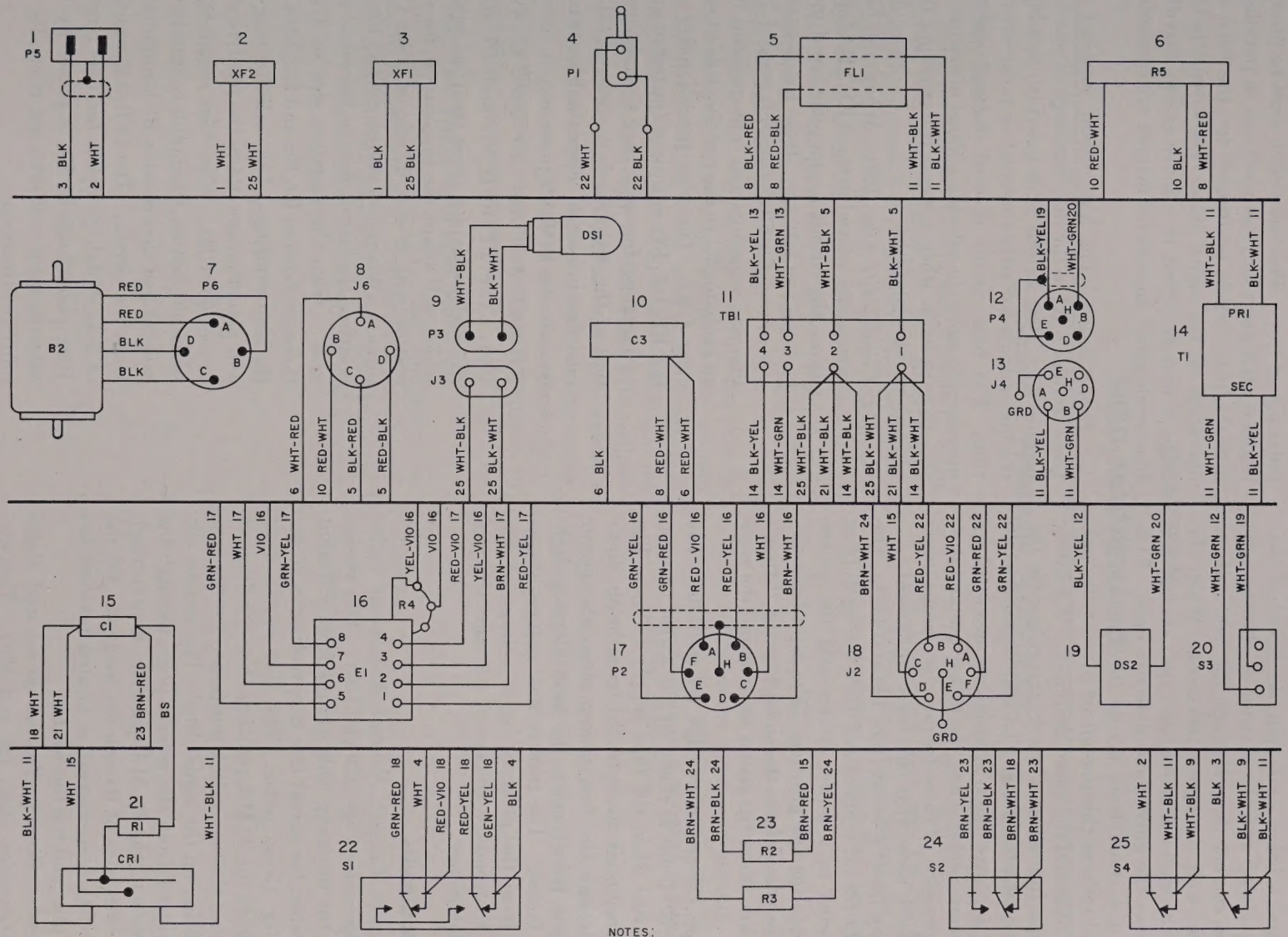
Figure 132. Teletypewriter Reperforator TT-107B/FG, wiring diagram.



NOTES:
1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. BS DENOTES TINNED COPPER PER ASA H44.
3. ⊏⊐▶— DENOTES SHIELDED CONNECTIONS.

TM2226-233

Figure 133. Teletypewriter Reperforator TT–109/FG, wiring diagram.

opening and closing the governor contacts which are in paralled with a 150-ohm resistor. When the motor speed is below 3,600 rpm, the governor contacts are closed and the resistor is shorted out; maximum current flows through the field coils of the motor, and the speed increases. When the speed of the motor is above 3,600 rpm, centrifugal force causes the governor contacts to open. This removes the short from across the 150-ohm resistor and reduces the amount of current through the field coils and the speed decreases. A resistor and a capacitor act as a spark suppressor for the governor contacts. Filter FL1 and capacitors C16 and C17 suppress radio frequencies generated by the governor contacts and the motor commutator. The suppression of these frequencies lessens interference with associated electronic equipment.

d. Copy Light Circuit (figs. 129 and 130). The copy light circuit is energized when the input plug is connected to a power source and the power switch is in the ON position. The copy light circuit can be traced from the ac input plug, through the two line fuses, the power switch, and the copy light.

e. Tape Alarm Circuit (figs. 129 and 130). The tape alarm circuit is closed by the alarm lever on the tape reel when the tape supply is low. The tape alarm circuit can be traced from the arc input plug, through the two power fuses, the power switch, the transformer, the tape alarm switch, and the buzzer. The transformer reduces the ac voltage from the primary input voltage of 115 volts to a secondary voltage of 6.8 volts that activates the buzzer.

153. Dc Circuits

a. Receive Circuit, Neutral 20-ma and Polar 15-ma Operation (figs. 129 and 130). This circuit receives the incoming code groups from a distant station when the signal line is operating at 20-ma neutral or 15-ma polar. The line switch must be placed in the 20 MA position (line windings in series) and the bias switch positioned for the type of operation on the signal line. The receive circuit is traced from the receive plug, through the line switch in the 20 MA position, and through the line windings of the selecter magnet. On the TT–107/FG, a ⅛ ampere is located between the receive plug and the line switch.

b. Receive Circuit, Neutral 60-ma and Polar 30-ma Operation (figs. 129 and 130). This circuit performs the same function as that in *a* above when receiving from a 60-ma neutral or 30-ma polar signal line. The line switch must be placed in the 60 MA position (line windings in parallel) and the bias switch positioned for the type of operation on the signal line. The circuit is the same as that described in *a* above except that the line windings of the selector magnet are connected in parallel.

c. Bias Circuit. The bias circuit supplies dc from rectifier CR1 to the bias windings of selector magnet E1. Bias switch S2 is provided to adapt the bias circuit for either neutral or polar operation. The bias circuit is used during neutral operation to move the selector-magnet armature to the space position when a space (no current) impulse is on the signal line.

(1) *TT–107/FG* (fig. 129). When the bias switch S2 is placed in the NEUTRAL position, the circuit is completed and may be traced as follows: from the negative side of rectifier CR1, through resistor R2, the bias windings and 50K resistor R4, and resistor R1 to the positive side of rectifier CR1. The bias potentiometer on the TT–107/FG must be adjusted to give optimum performance each time the position of the line switch is changed. The bias circuit is open when the bias switch S2 is in the POLAR position.

(2) *TT–107B/FG and TT–109/FG* (fig. 130). The TT–107B/FG and TT–109/FG each contain a three-position switch which will adapt the bias circuit for operation with 20-ma, 60-ma, or polar line signals. When bias switch S2 is in the 20 position, the circuit may be traced as follows: from the negative side of CR1, through resistors R1, R2, and R3, through the bias windings of the selector magnet and potentiometer R4 to the positive side of rectifier CR1. When bias switch S2 is in the 60 position, the circuit is exactly the same except that resistor R3 is eliminated from the circuit. The POLAR position of bias switch S2 opens the bias circuit. Bias potentiometer R4 is preset by the manufacturer and does not normally require readjustment.

CHAPTER 6

FIELD MAINTENANCE

Section I. PREREPAIR PROCEDURES

154. Tools

a. General. Tool Equipment TE–50–B is required for maintenance of the reperforators. Tool Equipments TE–50 and TE–50–A do not include the special wrenches and gages contained in Tool Equipment TE–50–B. Organizations which have Tool Equipments TE–50 or TE–50–A may requisition the added tools in accordance with appropriate supply bulletins.

b. Additional Tools. The necessity for reworking old parts or making new parts may require other metal cutting tools, such as drill sets, taps and dies for National Coarse and National Fine thread sizes, a ¼-inch electric hand drill, adjustable tap wrenches and die stocks, a metal handsaw and ¼-inch chisel. Welding and brazing equipment may be required for occasional emergency repairs. This equipment should be operated only by authorized skilled personnel.

155. Test Equipment and Materials

a. Test Equipment. The test equipment required to perform field maintenance on teletypewriter equipment includes the following test sets:

(1) Multimeter TS–297/U or Multimeter TS–352/U.

(2) Test Set TS–2/TG (provides normal or distorted test signals).

(3) Distortion Test Set TS–383/GG (provides normal or distorted test signals and a stroboscopic light for viewing the signals).

Note. Test Set TS–2/TG (fig. 134) is mounted in a wooden case with carrying handles. It normally is issued to field maintenance units that require a degree of mobility. Distortion Test Set TS–383/GG (fig. 135) is not easily transported and normally is issued to rear echelon repair shops.

b. Maintenance Materials. In addition to the organizational maintenance materials listed in paragraph 27, the following are required for field maintenance:

Name	Signal Corps stock No.
Tape TL–192	6N8692
Tape TL–83	6N8583
Grease	6G650
Oil, lubricating	6G1325

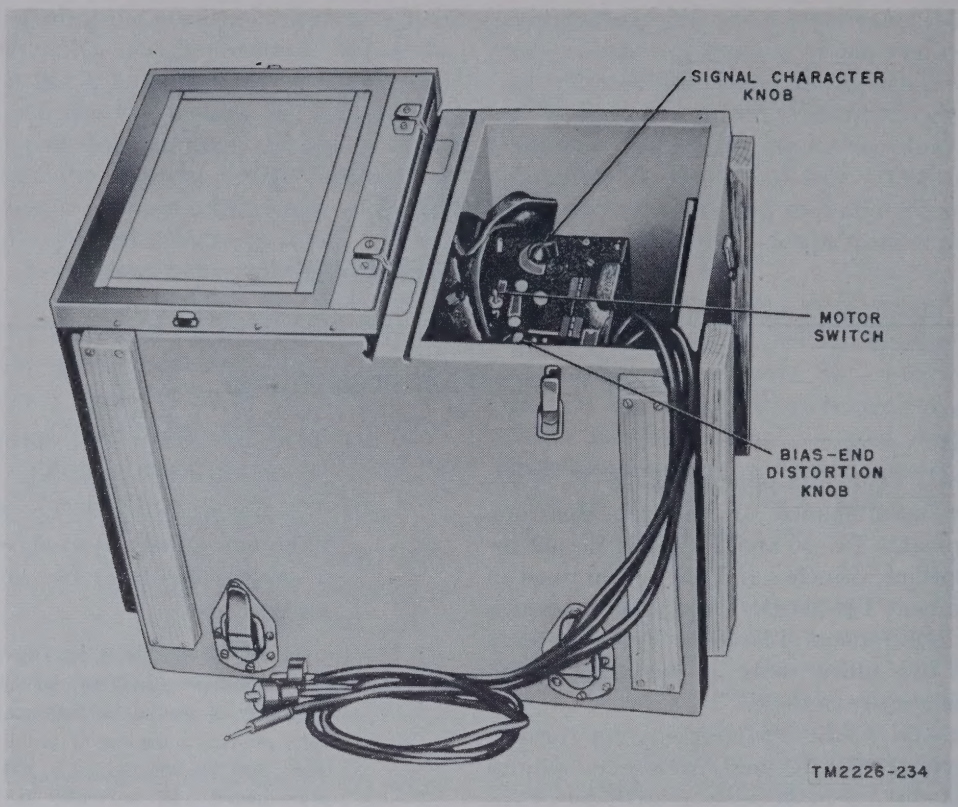


Figure 134. Test Set TS-2/TG.

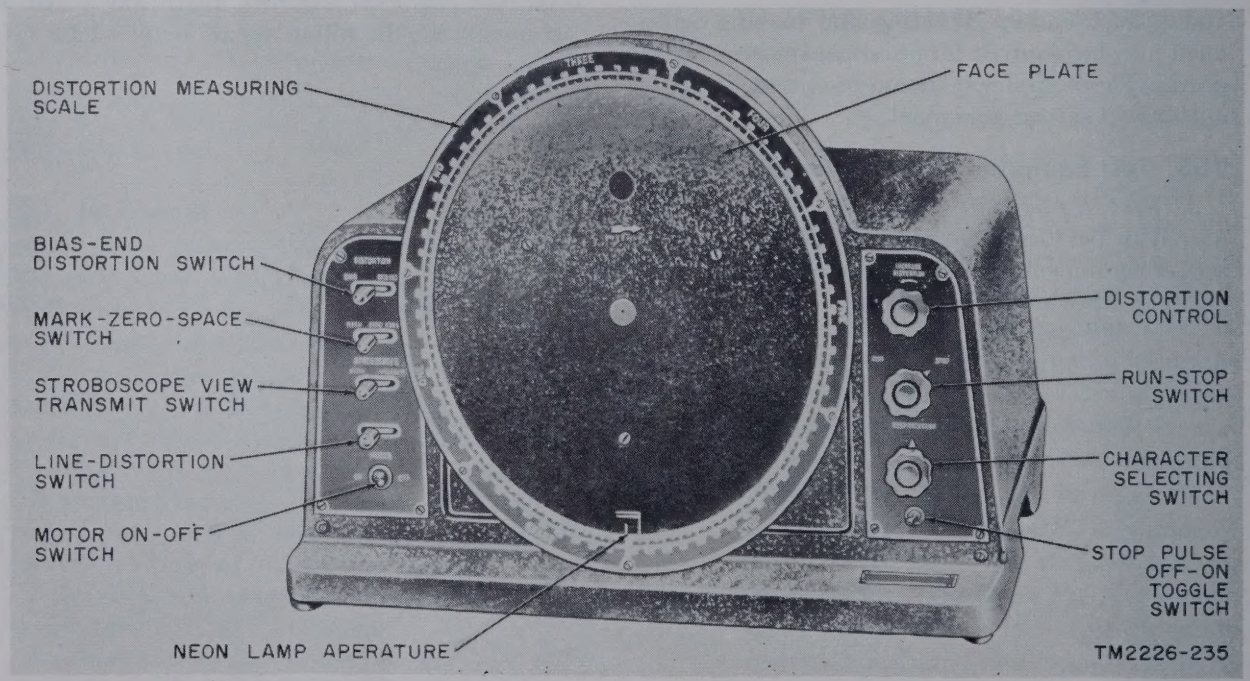


Figure 135. Distortion Test Set TS-383/GG.

Section II. INSPECTING, CLEANING, AND LUBRICATING

156. Inspection Procedure

When the reperforators require maintenance, the first step is to determine the nature and extent of the repairs. A prerepair inspection of this set should include the following checks:

a. Examine the general condition of the cover (par. 29*a*).

b. See that the machine is complete (par. 5).

c. Turn the motor over by hand and check for motor bind or visual signs of overheating (par. 33*c*).

d. Check all gears for excessive wear, backlash, or looseness.

e. Examine all bearings for wear, bind, or signs of overheating.

f. Inspect all mechanical assemblies for signs of damage incurred in transit.

g. Examine all castings for signs of cracks or broken portions.

h. Check the condition of the wiring and electrical cords (par. 33*f*).

157. Cleaning Procedures

The equipment should be cleaned thoroughly before any repair work is performed. Remove all dirt, grit, particles of paper tape, and oil or grease as described in *a* tnrough *f* below. Preparation for cleaning requires the removal of major assemblies.

a. Covers. Remove the dust cover (par. 12*c*) and clean the outer surfaces with a cloth slightly moistened with water. To remove oil or grease stains, moisten the cloth with solvent (SD).

b. Motor. Disconnect the motor plug. Remove loose dust and dirt from the exterior of the motor with a clean, dry, sash brush. To clean the interior of the motor, disassemble as described in paragraphs 169, 170, or 171 and remove loose dirt and dust with a sash brush. Use a cloth dampened with solvent (SD) to remove oil and gummy deposits. When cleaning the interior, be sure to remove all traces of solvent (SD). Be careful not to damage the wiring.

c. Selector-magnet Assembly. Disconnect the selector-magnet plug. Remove the complete magnet assembly (par. 177). The magnet coils may be cleaned with a cloth slightly dampened with solvent (SD). Never allow oil to be present between the magnet armature and pole pieces. To remove oil, insert a piece of Bell Seal Bond paper between the armature and pole pieces and allow the oil to soak into the paper. Repeat this procedure with fresh paper until all oil is removed. If the pole pieces are corroded, clean them with No. 0000 sandpaper and recoat them with a thin film of lacquer.

d. Ribbon Mechanism. Unhook the ribbon mechanism from the ribbon guides on each side of the type wheel and remove the inking ribbon and both ribbon spools. Remove the ribbon feed mechanism (pars. 182 and 183). Brush the loose dirt and dust from the mechanism with a sash brush and remove any oil or grease deposits with a cloth moistened with solvent (SD).

e. Main Frame Mechanisms. After the motor, selector mechanism, and the ribbon mechanism are cleaned, the main frame castings and remaining mechanisms may be cleaned with solvent (SD) or Cleaning Compound. Remove the main frames and remaining mechanisms from the base (par. 165*b*). Be careful not to immerse any of the ball bearings or bronze oil-impregnated sleeve bearings in a cleaning fluid. They are self-lubricating and immersion would be harmful. Parts with a black metallic finish have a protective, corrosion-resistant finish. *These parts should never be dipped in a cleaning fluid longer than is necessary to remove the dirt. Extended immersion is harmful to the protective finish.* After such cleaning, lightly spray these parts with oil.

Note. Do not use gasoline as a cleaning fluid. If an emergency requires the use of a substitute for the recommended cleaning fluids, fuel oil, diesel (D–40) may be used until the proper cleaning fluid is obtained. Never use carbon tetrachloride.

f. Base Frame and Associated Parts. After all other mechanisms (*a* through *e* above) are removed and cleaned, all that remains is the base frame, filter box, and tape reel assembly. Remove loose dust, dirt, and tape particles from the base with a sash brush. Remove oil and grease deposits with a cloth moistened with solvent (SD). If the base frame and filter box are extremely dirty, it may be necessary to remove the filter box to clean the unit thoroughly. Use a cloth slightly dampened with water to clean the rubber-covered cords. Brush the dust and dirt from the wiring and electrical components with a clean, dry sash brush.

158. Rustproofing and Painting

a. If the finish on the reperforator becomes badly scratched or scarred, prevent rust and corrosion by touching up bared surfaces. Use No. 000 or No. 0000 sandpaper to clean the surfaces down to the bare metal. Obtain a bright, smooth finish. Do not use steel wool; minute particles of steel wool can enter the electrical parts and cause harmful internal shorting and grounding of circuits.

b. When a touchup job is necessary, apply paint with a small brush. When numerous scars and scratches warrant complete repainting, remove the reperforator from service. Place protective masking over all areas where paint is not required or may cause damage. Then spray paint over the entire surface. Remove slight rust from corroded metal by cleaning with solvent (SD). In severe cases, it may be necessary to use solvent (SD) to soften the rust and then sandpaper to complete the preparation for painting. Restore moisture and fungiproofing.

159. Lubrication, Assembly, and Operational Test

When the components are thoroughly cleaned (par. 157) all parts that are susceptible to wear should be examined carefully for traces of excessive wear. Worn parts should be replaced and adjusted according to instructions in paragraphs 45 through 124. Particular attention should be given to gear teeth, sleeve bearings and shafts, ball bearings, and surfaces of cams and associated levers.

a. Lubrication. After replacement of worn parts, lubricate each mechanical assembly as described in paragraph 39. If evidence of overheating or wear is discovered at points that are normally self-lubricating (oil-impregnated parts), restore lubrication to these parts by immersion for 20 minutes in Lubricating Oil, Signal Corps stock No. 6G1325, heated to 140° F.

b. Assembly. As each of the disassembled mechanisms is lubricated, replace it on the unit. Renew the coating of antiseize compound on any steel screws that are to be screwed into aluminum or magnesium castings. This coating is necessary because steel screws, unless coated with this compound, have a tendency to seize in the casting and make future removal of the screws very difficult. The recommended antiseize compound is available through regular supply channels as a Corps of Engineers item, stock No. CE–52–2724.500.080.

c. Operational Test. After the reperforator is cleaned, lubricated, and assembled, an operational test must be made of the complete unit. Prepare the reperforator-transmitter for testing (par. 22) and test as described in paragraph 23. If the reperforator operates improperly, locate the fault by using the trouble shooting chart (par. 163). If the reperforator operates properly, it should receive a prolonged test run before installation into the communication system. Under normal conditions, equipment should be test run for at least 1 hour to lessen the possibility of failure after installation into the system.

Section III. TROUBLESHOOTING AT FIELD MAINTENANCE LEVEL

160. General

a. The troubleshooting information presented in this section consists of a series of operational, mechanical, and electrical checks designed to lead maintenance personnel to the specific part, adjustment, or electrical component that is causing trouble in a reperforator.

b. Determine whether the trouble is electrical or mechanical as follows:

(1) Disconnect the power cord and receive plug of the reperforator and check the movement of the selector-magnet armature by hand. The armature should move freely from the marking to the spacing position without bind.

(2) Place the power cord into a power outlet and place the power switch to the ON position. Connect the receive plug to a signal or test line and adjust the line and bias switches in accordance with the type of signal on the line (par. 17).

(3) If the reperforator runs *open*, manually operate the magnet armature to the marking position. If this causes the reperforator to run *closed*, the trouble is electrical. If the reperforator continues to run *open*, the trouble is mechanical.

161. Localizing Electrical Troubles

Many electrical troubles may be located visually. Others require the methodical testing of each

circuit, and the testing of individual components in each circuit. Be sure that the power cord plug is pressed firmly into the power outlet and the receive plug into the associated jack. If the motor fails to operate, or the copy light fails to light, check the two power fuses at the rear of the terminal box. Check the power at the power outlet. On the TT–107/FG, if the motor operates properly and the machine runs open, check the $\frac{1}{8}$-ampere fuse in the receive circuit.

162. Localizing Mechanical Troubles

a. If the trouble has definitely been established as mechanical, and the code rings are not positioned in accordance with the code group received, the fault is in the selector or transfer mechanism. The impulse recording train of parts for each code impulse must be examined carefully while turning the motor shaft manually. If each code impulse is properly recorded in the Y-levers, check the transfer operation and associated code-ring mechanisms.

b. If the printing mechanism prints the correct character but the punching mechanism does not, the trouble may be located by a careful examination of the punching mechanism while turning the motor over manually.

c. If the correct code holes are punched in the paper tape but an incorrect character is printed, the fault is in the character selection and printing mechanism. Examine the operation of this mechanism while rotating the motor manually.

d. The symptoms, causes, and corrective action for additional common mechanical troubles are listed in the trouble-shooting chart.

163. Troubleshooting Chart

The most common reperforator troubles, probable causes, and corrective actions are listed in the charts below. Both electrical and mechanical troubles are listed, but they are not separated into groups because some faulty conditions may be caused by either type of trouble. Several probable causes are listed for most troubles, but they rarely occur at the same time. The troubleshooter must determine by a thorough check of each item which one causes the particular trouble under investigation. The troubles listed are common to all items of equipment unless otherwise indicated.

Symptom	Probable cause	What to do
1. Motor fails to start	Power input fuse blown	Replace fuse (par. 13*a*).
	Failure of power source	Correct defect or use another power source.
	Governor spring loose or broken (TT–109/FG).	Repair or replace spring (par. 173).
	Governor electrical contacts dirty or pitted (TT–109/FG).	Clean, burnish or replace electrical contacts (par. 173*b*).
	Electrical contact brushes not seated properly or badly worn (TT–109/FG).	Adjust or replace electrical contact brush (par. 172).
	Open field or armature winding	Replace motor (pars. 169, 170, or 171).
	Bind in the shafts or bearings	Locate and correct trouble in mechanism (pars. 169, 170, or 171).
2. Motor runs but speed is erratic	Governor electrical contacts dirty or pitted (TT–109/FG).	Clean, burnish or replace electrical contacts (par. 173).
	Governor spring broken (TT–109/FG).	Replace spring (par. 173).
3. Reperforator operates properly but causes clicks and noises in local radio equipment.	Reperforator not grounded properly	Ground reperforator (par. 13).
	Filter assemblies in motor circuit open (TT–109/FG).	Check filter circuits (par. 161).
4. Reperforator runs open (mechanism does not stop operating) when line current should be steady marking.	Transfer lever trip latch spring broken or missing.	Replace transfer lever trip latch spring (par. 200).
	External signal line circuit open or shorted.	Check signal line for continuity or short
	Low line current	Check signal circuit power source and adjustment of line current control resistor (not part of reperforator).
	Signal line fuse blown (TT–107/FG)	Replace fuse (par. 13*a*).

Symptom	Probable cause	What to do
4. Reperforator runs open (mechanism does not stop operating) when line current should be steady marking—Continued	*Space* instead of *mark* impulses received (polar operation).	Reverse signal line connection.
	Receive circuit open or shorted	Check receive circuit for continuity or short and repair fault (par. 161).
	Selector magnet armature not holding stop lever.	Readjust selector magnet bracket and stop lever (par. 110).
	Selector camshaft locking lever spring broken.	Replace spring (par. 194 or 195).
	Selector camshaft stop plate or locking lever worn or broken.	Replace stop plate or lever (pars. 194, 195, or 203).
	Bias potentiometer not adjusted properly (neutral operation).	Readjust bias potentiometer (par. 15*c*).
5. Motor operates but reperforator runs closed (does not respond to incoming code signals).	Motor worm gear not rotated by motor	Check for broken or missing motor shaft pin (pars. 169, 170, or 171).
	Main shaft not rotated by worm gear	Check for broken or missing gear keys or pin on main shaft (par. 204 or 205).
	Bias switch in POLAR position for neutral operation.	Set switch to NEUTRAL position.
	Selector friction clutch failing	Set clutch collar for proper spring tension (pars. 112 and 113).
	Maladjusted selector Y-lever eccentric	Adjust eccentric (par. 114).
	Maladjusted selector magnet bracket	Adjust bracket (par. 110).
	Open component in bias circuit	Check bias potentiometer, bias windings of magnet, fixed resistor (par. 161).
6. Reperforator prints but range (rangefinder measurement) is narrow.	Line current too high or too low	Readjust line current (par. 19).
	Bias potentiometer improperly set	Readjust bias potentiometer (par. 15*d*).
	Motor speed improper at transmitting teletypewriter.	Request transmitting station to make motor speed check.
	Selector mechanism improperly adjusted.	Make complete readjustment of selector mechanism (par. 100).
7. Reperforator prints errors or scrambles letters and functions.	Rangefinder or bias potentiometer improperly set.	Readjust bias potentiometer and rangefinder (par. 15*d*).
	Transfer lever trip latch spring broken or missing.	Replace spring (par. 200).
	Excessive crossfire or noise pickup on line.	Check line and associated equipment.
	Selector camshaft friction clutch slipping.	Readjust clutch and tighten setscrews or replace worn felt washers (pars. 112 and 113).
	Dirty, binding, or sticking selector mechanism.	Clean and adjust selector mechanism (par. 100).
	Worn or broken Y- or T-levers	Replace defective parts (pars. 194, 195, and 200).
	Selector camshaft stop plate loose	Replace selector camshaft (par. 203).
	Selector lever spring broken	Replace spring (pars. 194 or 195).
	Selector magnet or mounting loose	Readjust and tighten mounting screws (par. 102).
8. Reperforator continues to print the same character or perform the same function although no additional signals are being received.	Transfer lever trip latch spring or transfer lever spring broken.	Replace broken spring (par. 200).
9. Certain characters (or functions) will not print.	Stop bar sticking	Clean stop bar guide plates and code rings (pars. 198 and 199).
	Stop bar lever spring broken	Replace spring (pars. 198 and 199).
10. Type wheel will not stay in figures shift position.	Letters-figures shift latch lever spring broken or missing.	Replace spring (par. 196).
	Letters stop bar broken	Replace stop bar (pars. 198 and 199).

Symptom	Probable cause	What to do
11. Type wheel cannot be prevented from returning to figures shift position or is erratic.	Figures stop bar broken	Replace stop bar (pars. 198 and 199).
	Figures sensing lever spring broken	Replace spring (par. 196).
12. Signal bell does not operate	Clapper bent	Straighten clapper as required to sound bell or replace clapper (par. 61).
	Broken or loose bell sensing lever spring.	Replace or attach spring (par. 196).
	Maladjusted bell stop bar adjustable fulcrum in code-ring cage (TT–107B/FG and TT–107/FG).	Adjust fulcrum (pars. 59 and 60).
13. Reperforator prints part of characters only.	Type wheel not properly adjusted on type wheel post.	Readjust post setting (par. 50).
	Ribbon feed not operating properly	Check ribbon feed (par. 91).
	Type wheel hub assembly not alined with type wheel.	Check alinement (par. 98).
14. Printing too light	Print hammer lever not adjusted properly.	Adjust print hammer eccentric stop (par. 86).
	Ink reservoir empty (TT–107/FG)	Fill reservoir (par. 29*e*).
	Worn ribbon	Replace ribbon (par. 22*c*).
15. Ribbon does not feed or ribbon feed does not reverse.	Ribbon spools not seated correctly	Check seating of spools (par. 22).
	Ribbon reversing arm contact plunger spring missing or broken.	Replace spring (pars. 182, 183, 184, and 185).
	Ribbon sensing lever bent, dirty, or broken.	Clean and adjust or replace parts as required (pars. 182, 183, 184, and 185).
16. Reperforator operates correctly but emits grinding or whining noise.	Fouled bearings in motor, main shaft, or function shaft.	Replace bearings if necessary (pars. 168, 169, 170, 201, 202, 204, and 205).
	Motor shaft or main shaft bent	Replace bent shaft (pars. 168, 169, 170, 204, and 205).
17. Tape perforations improperly spaced.	Feed sprocket detent lever not adjusted.	Adjust detent lever (par. 84).
18. Tape breaks	Tape puller mechanism improperly timed.	Adjust tape puller (pars. 118 and 119).
	Tape reel binding	Remove obstacle binding tape reel.
19. Manual tape feed-out does not operate.	Loose lever or linkage	Adjust manual tape feed-out mechanism)par. 114).
20. Tape does not feed properly	Feed pawl pivot out of adjustment	Adjust pivot (par. 83).

Section IV. REMOVAL AND REPLACEMENT OF TELETYPEWRITER REPERFORATOR COMPONENTS

164. General

a. This section describes replacement procedures required to overhaul completely a defective or inoperative Teletypewriter Reperforator TT–107(*)/FG or TT–109/FG. Operationally, the TT–107B/FG and the TT–109/FG are identical; the only difference is in the motors and motor filters. Procedures for the TT–107B/FG will apply to the TT–109/FG except for the items that are separately identified. Procedure includes replacement of all parts of the unit except those parts for which the procedure is obviously simple.

b. Except in extreme emergency, all repairs should be made by personnel thoroughly trained in teletypewriter maintenance. It is as important to know what not to do as well as what to do. Equipment operating with minor faults may fail completely as the result of efforts by inexperienced personnel to correct apparently simple defects.

c. Follow the inspection, cleaning, and lubricating instructions given in paragraphs 156 through 159. Whenever repairs are made, the reperforator should be completely readjusted in accordance with paragraphs 45 through 124.

165. General Disassembly Procedure

a. Preparation for Disassembly. Follow instructions in (1) through (8) below before disassembling the reperforator.

(1) Arrange a clean place on a bench or table to work. Make certain that dust

or dirt will not fall or be blown into the mechanism while it is disassembled.

(2) Obtain several small, clean cardboard, wood, or metal containers to store removed parts.

(3) Arrange the necessary tools and materials so that they will be readily accessible during the progress of the repair work.

b. Disassembly Procedure.

(1) Disconnect the power and signal line connections.

(2) Remove the dust cover (par. 12*c*).

(3) Remove the inking ribbon and paper tape roll (par. 37*a*(2) or (3) and 22*b*(1)(*a*), or *b*(2)(*a*) through (*c*).

(4) On the TT–107/FG, unplug the selector magnet and motor cables and remove the three self-locking hexagonal nuts (7, fig. 170), lockwashers (8), machine screws (9), flat washers (10), and single machine screw (11), self-locking hexagonal nut (12), and lockwasher (13) that hold the front and rear reperforator frames to the base casting; remove the assembled reperforator mechanism.

(5) On the TT–107B/FG and TT–109/FG, remove the four machine screws (7 and 9, fig. 171) and lockwashers (8 and 10) from the studs (48 and 56) and lift the assembled reperforator off the base casting.

(6) Proceed to disassemble the various parts and assemblies; use the correct tool for each specific operation. Do not disassemble the reperforator or its assemblies beyond the point necessary to thoroughly inspect and clean the mechanism, and to repair and replace defective parts.

(7) When small parts are disassembled, place them in a container. The sequence of disassembly may be varied to meet any particular situation.

(8) While the equipment is disassembled for checking and repair, replace any parts that are likely to cause trouble before the next scheduled overhaul of the machine.

166. General Reassembly Procedures

All parts, subassemblies, and units should be reassembled in accordance with the following provisions.

a. Replace all worn or broken parts that may cause malfunctioning of the reperforator and adjust them in accordance with the directions in paragraphs 44 through 124.

b. In reassembly, tighten all screws, nuts, and bolts carefully, but not excessively. Many of the threaded holes are tapped into aluminum or magnesium alloy castings. These threads may be stripped by the use of too much force. To prevent binding when installing steel screws in aluminum or magnesium alloy castings, it is important that they be treated with antiseize compound, stock No. CE–52–2724.500.080 before installation.

c. Replace the correct springs in the friction clutches. Although the springs are similar in appearance, they are not identical. Improper assembly could cause faulty operation and premature failure of the clutches. (Refer to pars. 214–218, for spring data).

d. When parts are secured on shafts by setscrews, remove the setscrews and aline the tapped holes with the flats on the shafts.

e. Support parts into which taper pins are being driven with wooden or other soft supports to prevent bending or distortion.

f. If the locking edges of lockwashers are rounded, install new lockwashers.

g. Replace screws or nuts that have damaged heads or threads.

h. Some bent and distorted parts may be restored to shape and reused if no cracks result from the straightening process.

167. Removal and Replacement of Motor

a. Removal.

(1) Remove the reperforator dust cover (par. 12*c*).

(2) Disconnect the motor cable plug from the connector at the rear of the base frame.

(3) Remove the four machine screws (1, fig. 136, 137, or 138) and lockwashers (2) that hold the motor to the rear reperforator frame; remove the motor.

Note. The TT–107/FG has a spacer (3, fig. 136) between the lockwasher and rear reperforator frame.

b. Replacement.

(1) Position the motor on the rear reperforator frame; secure with the four machine

screws and lockwashers (1 and 2, fig. 136, 137, or 138).

Note. Install the spacer (3, fig. 136) between the lockwasher and the rear reperforator frame on the TT–107/FG.

(2) Connect the motor cable plug to the connector on the base frame.

(3) Replace the dust cover (par. 12*e*).

168. Changing Motor Drive Gearset.

a. Remove the motor as described in paragraph 167*a*.

b. Remove the machine screw (1, fig. 165 or 166) and lockwasher (2) that hold the main shaft driven gear (3) to the main shaft; remove the main shaft driven gear (3).

c. Remove the machine screw and lockwasher that hold the worm gear to the lower end of the motor shaft; remove the worm gear.

d. Remove the machine screw (1, fig. 170 or 171) that holds the alternate worm gear (2) to the base frame; remove the alternate worm gear. Install the alternate worm gear (2) on the motor shaft.

e. Remove the machine screw (3, fig. 170 or 171), lockwasher (4), and flat washer (5) that hold the alternate main shaft driven gear (6) to the base frame; remove the alternate main shaft driven gear (6). Install the alternate main shaft driven gear on the main shaft.

f. Mount the replaced drive gearset on the base frame for storage.

g. Replace the motor as described in paragraph 167*b*.

169. Disassembly and Reassembly of Synchronous Motor (TT–107/FG)

(fig. 136)

a. Disassembly.

(1) Remove the motor from the reperforator as described in paragraph 167*a*.

(2) Remove the machine screw (4) and lockwasher (5) that hold the worm gear (6) to the shaft on the rotor (34); remove the worm gear (6).

(3) Remove the receptacle connector (7), ferrules (8 and 9), and nut (10) from the motor cable.

(4) Remove the two setscrews (11) that hold the motor shaft knob (12) to the rotor shaft; remove the motor shaft knob (12).

(5) Remove the three machine screws (13) and lockwashers (14) that hold the end plate (15) to the bracket (22); remove the end plate (15), flat washer (16), thrust pad (17), and flat washer (18) from the end of the rotor shaft.

(6) Remove the two machine screws (19) and lockwashers (20) that hold the cable clamp (21) to the brackets (22 and 27); remove the cable clamp (21).

(7) Remove the three remaining machine screws (19) and lockwashers (20) that hold the bracket (22) to the stator (35); remove the bracket (22) and air guide (23) from the stator (35).

(8) Remove the pin (24) from the rotor shaft. Remove the three machine screws (25) and lockwashers (26) that hold the bracket (27) to the stator (35); remove the bracket (27) and slide the flat washer (28), thrust pad (29), flat washer (30), and air guide (31) off the rotor shaft of the rotor.

(9) Remove the ball bearings (32 and 33) from each end of the rotor shaft. Remove the rotor (34) from the stator (35).

b. Reassembly.

(1) Reassemble the motor as indicated in figure 136; the sequence for assembling is the reverse of the disassembly sequence.

(2) Replace the motor on the reperforator as described in paragraph 167*b*.

170. Disassembly and Reassembly of Synchronous Motor (TT–107B/FG)

(fig. 137)

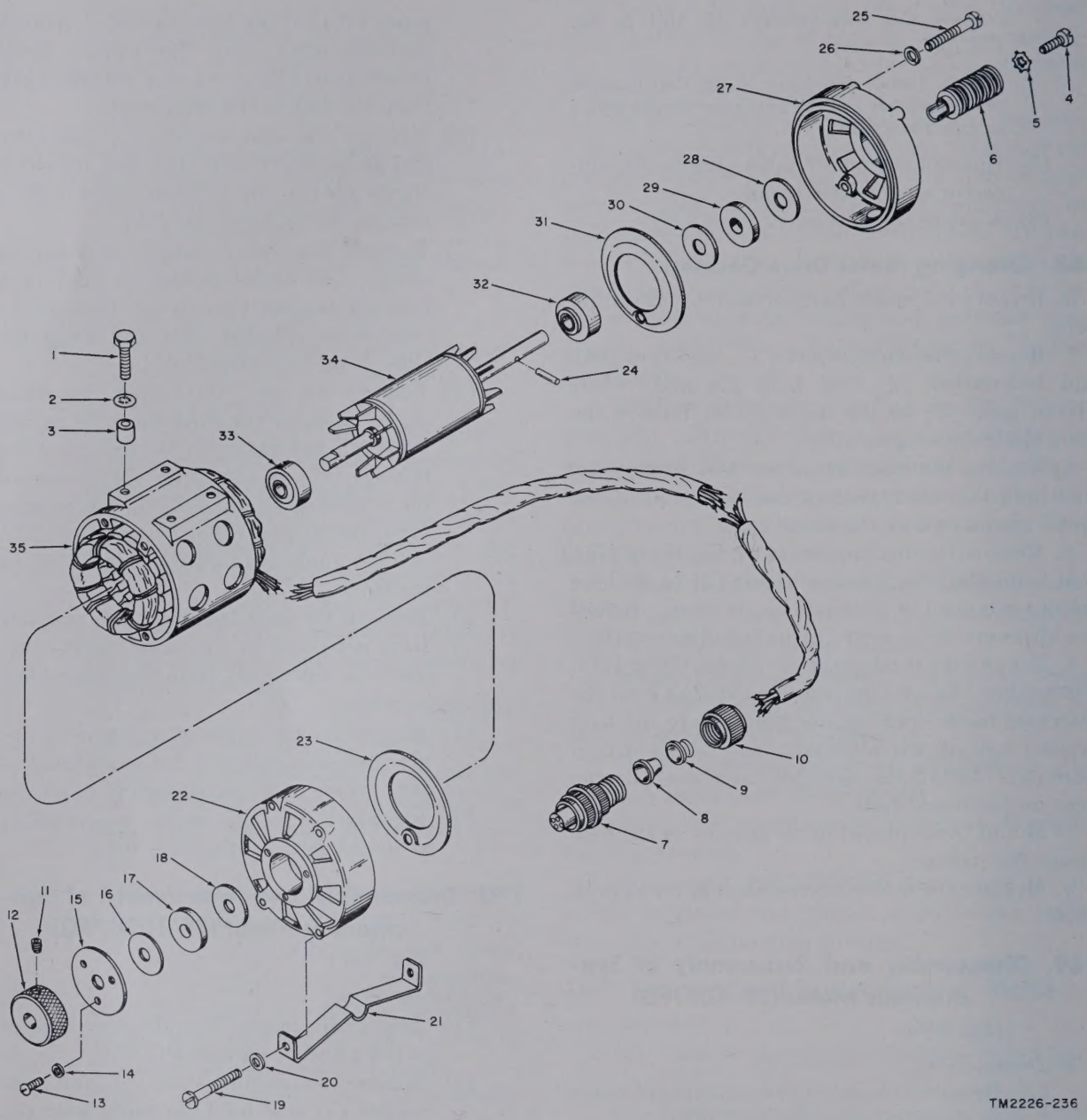
a. Disassembly.

(1) Remove the motor from the reperforator as described in paragraph 167*a*.

(2) Remove the machine screw (3) and lockwasher (4) that hold the worm gear (5) to the rotor shaft (36); remove the worm gear (5).

(3) Remove the plug connector (6) from the motor cable (7) and disconnect the motor cable (7) from the elbow connector (10).

(4) Remove the four machine screws (8) and lockwashers (9) that hold the elbow connector (10) to the mounting plate (12); remove the connector (10) from the mounting plate (12). Remove the nipple (11), mounting plate (12), and lockwasher (13) from the bracket (29).



1	Machine screw, 10079	13	Machine screw	25	Machine screw
2	Lockwasher, 10405	14	Lockwasher	26	Lockwasher
3	Spacer, 55148	15	End plate	27	Bracket
4	Machine screw, 50207	16	Flat washer	28	Flat washer
5	Lockwasher, 10406	17	Thrust pad	29	Thrust pad
6	Worm gear, 50350	18	Flat washer	30	Flat washer
7	Receptacle connector, 20421	19	Machine screw	31	Air guide
8	Ferrule, 20847	20	Lockwasher	32	Ball bearing
9	Ferrule, 20848	21	Cable clamp	33	Ball bearing
10	Nut, 10533	22	Bracket	34	Rotor
11	Setscrew, 10211	23	Air guide	35	Stator, 53364
12	Motor shaft knob, 54217	24	Pin		

Figure 136. Synchronous motor, exploded view (TT–107/FG).

Note. Items 13 through 35 are part of 53503A.

(5) Remove the two setscrews (14) that hold the motor shaft knob (15) to the rotor shaft. Remove the motor shaft knob (15).

(6) Remove the three machine screws (16) and lockwashers (17) that hold the end plate (18) to the bracket (24); remove the end plate, flat washer (19), thrust pad (20), and flat washer (21) from the end of the rotor shaft.

(7) Remove the four machine screws (22) and lockwashers (23) that hold the bracket (24) to the stator (37); remove the bracket (24) and air guide (25).

(8) Remove the pin (26) from the rotor shaft. Remove the four machine screws (27) and lockwashers (28) that hold the bracket (29) to the stator (37); remove the bracket (29) and slide the flat washer (30), thrust pad (31), flat washer (32), and air guide (33) off the rotor shaft.

(9) Remove the ball bearings (34 and 35) from each end of the rotor shaft. Remove the rotor (36) from the stator (37).

b. Reassembly.

(1) Reassemble the motor as indicated in figure 137; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the motor on the reperforator as described in paragraph 167*b*.

171. Disassembly and Reassembly of Series-Governed Motor (TT–109/FG)

a. Disassembly (fig. 138).

(1) Remove the motor from the reperforator as described in paragraph 167*a*.

(2) Remove the machine screw (3) and lockwasher (4) that hold the worm gear (5) to the armature shaft; remove the worm gear (5).

(3) Remove the plug connector (6) from the motor cable (7) and the motor cable (7) from the elbow connector (10).

(4) Remove the four machine screws (8) and lockwashers (9) that hold the elbow connector (10) to the mounting plate (12); remove the elbow connector (10). Remove the nipple (11), mounting plate (12), and lockwasher (13) from the motor.

(5) Remove the pin (14) from the motor armature shaft; remove the grease seals (15 and 16) from the motor armature shaft.

(6) Remove the setscrew (17) that holds the motor governor target (18) to the shaft of the motor speed governor base (42); remove the motor governor target (18).

(7) Remove the two machine screws (19) and lockwashers (20) that hold the motor governor cover (21) to the motor (47); remove the motor governor cover.

(8) Remove the two setscrews (22) that hold the motor speed governor base (43) to the motor armature shaft; remove the assembled motor governor.

(9) Remove the spring (23) and the governor worm (24) from the motor governor.

(10) Remove the electrical contact brush (25) from the motor governor.

(11) Remove the two electrical contact brushes (26).

(12) Remove the brush shields (44), brush caps (45), and brushes (46).

b. Reassembly (figs. 128 and 138). Check the motor governor brushes (46). Clean them if they are dirty or glazed; replace them if they are worn, chipped, or saturated with oil.

(1) Reassemble the motor as indicated in figure 138; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the motor as described in paragraph 167*b*.

(3) Adjust the motor speed as described in paragraph 15.

172. Removal and Replacement of Motor Brushes (TT–109/FG)

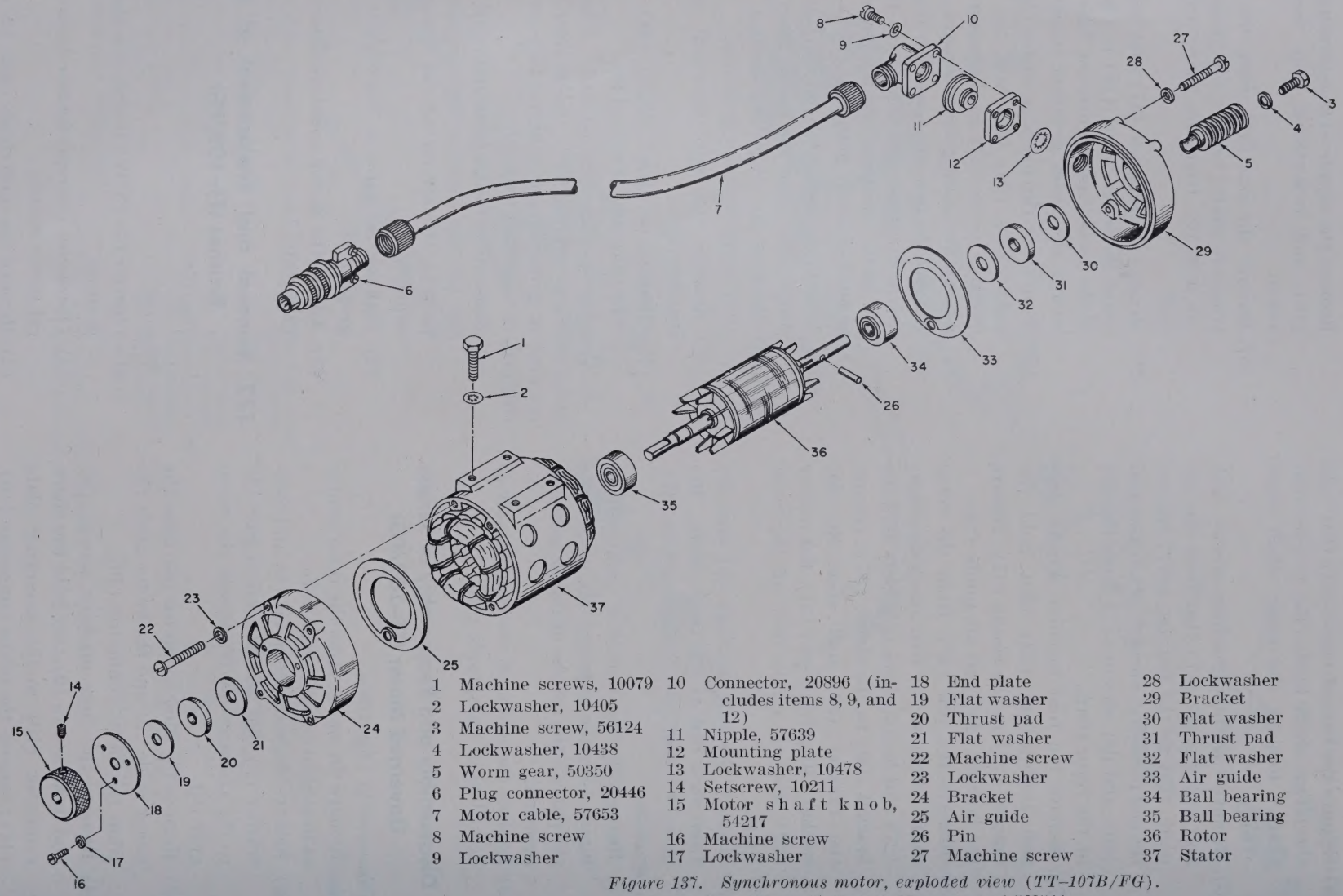
(fig. 138)

a. Removal.

(1) Operate the POWER switch to the OFF position.

(2) Disconnect the reperforator from the local power source.

(3) Remove the dust cover (par. 12*c*).



1	Machine screws, 10079	10	Connector, 20896 (includes items 8, 9, and 12)	18	End plate	28	Lockwasher
2	Lockwasher, 10405	11	Nipple, 57639	19	Flat washer	29	Bracket
3	Machine screw, 56124	12	Mounting plate	20	Thrust pad	30	Flat washer
4	Lockwasher, 10438	13	Lockwasher, 10478	21	Flat washer	31	Thrust pad
5	Worm gear, 50350	14	Setscrew, 10211	22	Machine screw	32	Flat washer
6	Plug connector, 20446	15	Motor shaft knob, 54217	23	Lockwasher	33	Air guide
7	Motor cable, 57653	16	Machine screw	24	Bracket	34	Ball bearing
8	Machine screw	17	Lockwasher	25	Air guide	35	Ball bearing
9	Lockwasher			26	Pin	36	Rotor
				27	Machine screw	37	Stator

Figure 137. Synchronous motor, exploded view (TT–107B/FG).

Note. Items 16 through 37 are part of 56854A.

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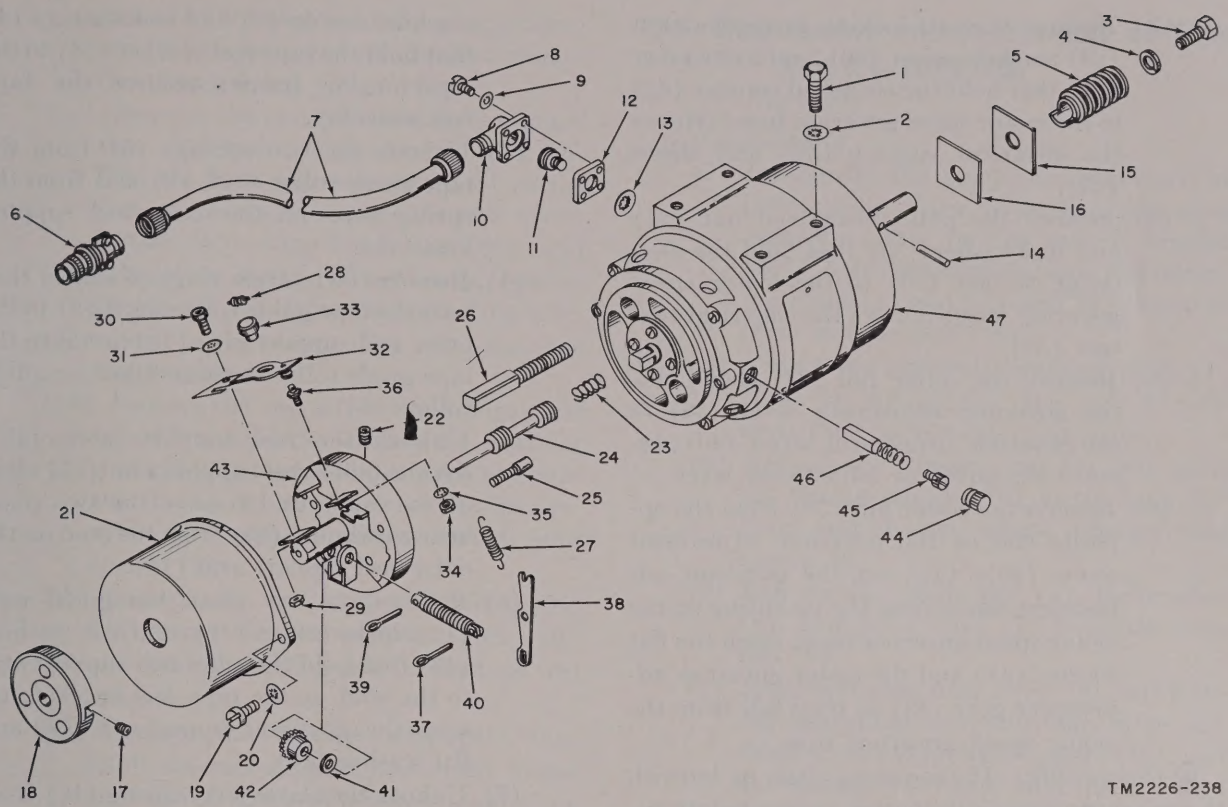


1	Machine screw, 10079	17	Setscrew, 10204	34	Plain hexagonal nut, 10507
2	Lockwasher, 10405	18	Motor governor target, 50303A	35	Lockwasher, 10404
3	Machine screw, 56124	19	Machine screw, 10321	36	Electrical contact, 50338
4	Lockwasher, 10438	20	Lockwasher, 10412	37	Cotter pin, 10800
5	Worm gear, 50350	21	Motor governor cover, 50311	38	Governor adjustment lever, 50301
6	Plug connector, 20446	22	Setscrew, 10203	39	Cotter pin, 10800
7	Motor cable, 20900	23	Spring, 51855	40	Governor adjustment screw, 50299
8	Machine screw	24	Governor worm, 56555A	41	Flat washer, 50148
9	Lockwasher	25	Electrical contact brush, 51154	42	Motor governor adjustment gear, 50278A
10	Elbow connector, 20896 (includes items 8, 9, and 12)	26	Electrical contact brush, 51543A	43	Motor speed governor base, 51249A
11	Nipple, 57639	27	Spring, 50334	44	Motor brush shield, 51155
12	Mounting plate	28	Grooved pin, 50302	45	Motor brush cap
13	Lockwasher, 10478	29	Self-locking hexagonal nut, 10500	46	Motor brush, 56834A
14	Pin, 50359	30	Machine screw, 10001	47	Motor, 51696
15	Grease seal, 50949	31	Lockwasher, 10403		
16	Grease seal, 50949	32	Electrical contact, 50281A		
		33	Sleeve, 50293		

Figure 138. Series-governed motor, exploded view (TT–109/FG).

(4) Remove the motor brush shields (44, fig. 138) and brush caps (45).

(5) Remove the motor brushes (46).

b. Replacement.

(1) Insert the motor brushes (46) in the motor brush guides.

(2) Replace the motor brush caps (45) and motor brush shields (44).

(3) Replace the dust cover (par. 12*e*).

(4) Connect the reperforator to the local power source.

(5) Operate the POWER switch to the ON position.

173. Disassembly and Reassembly of Motor Governor (TT–109/FG)

(fig. 138)

a. Disassembly.

(1) Remove the motor governor from the motor as described in paragraph 171*a*(6) through (8).

(2) Remove the spring (27) from the governor adjustment lever (38) and from the grooved pin (28). Remove the grooved pin.

(3) Remove the self-locking hexagonal nut (29) machine screw (30), and lockwasher (31) that hold the electrical contact (32) to the motor speed governor base; remove the electrical contact (32) and sleeve (33).

(4) Remove the plain hexagonal nut (34) and lockwasher (35) that hold the electrical contact (36) to the motor speed governor base; remove the electrical contact (36).

(5) Remove the cotter pin (37) that holds the governor adjustment lever (38) to the governor adjustment screw (40); remove the governor adjustment lever.

(6) Remove the cotter pin (39) from the opposite end of the governor adjustment screw (40); turn out the governor adjustment screw from the mounting on the motor speed governor base; catch the flat washer (41) and the motor governor adjustment gear (42) as they fall from the motor speed governor base.

b. Reassembly. If necessary, clean or burnish the governor electrical contact points before reassembly. Remove any built up or pitted portions of the contacts with a contact file. Do not remove any more metal than is required.

(1) Reassemble the motor governor as indicated in figure 138; the sequence for assembling the parts is the reverse of the disassembly sequence. Adjust the governor contacts as described in paragraph 120.

(2) Replace the series-governed motor as described in paragraph 167*b*.

(3) Adjust the speed of the series governed motor as described in paragraph 15.

174. Disassembly and Reassembly of Tape Reel (TT–107/FG)

(fig. 139)

a. Disassembly.

(1) Disconnect the receptacle connector from the plug connector (36) attached to the tape reel bracket (53).

(2) Remove the machine screw (1) and self-locking hexagonal nut (2) that hold the tape reel bracket (53) to the tape supply reel mounting bracket. Remove the three machine screws (3) and lockwashers (4) that hold the tape reel bracket (53) to the reperforator frame; remove the tape reel assembly.

(3) Unhook the two springs (5) from the tape guide roller shaft (9) and from the spring posts on the outer reel support arm (14).

(4) Remove the retainer rings (6 and 7) that hold the tape guide roller shaft (9) to the outer reel support arm (14); remove the tape guide roller shaft and the two guide rollers (8).

(5) Unlatch the reel support latch (46), lift the outer reel support arm (14) clear of the latch, and remove the two plain hexagonal nuts (10) from the stud on the outer reel support arm (14).

(6) Remove the two plain hexagonal nuts (11), lockwashers (12), and flat washers (13) that hold the outer reel support arm to the stud on the tape reel bracket; remove the outer reel support arm (14) and flat washer (15).

(7) Unhook the alarm lever spring (16) from the tape reel bracket (53) and from the tape-out alarm lever (21).

(8) Remove the retainer ring (17) that holds the tape-out-alarm lever to the stud on the tape reel bracket; remove the assembled tape-out alarm lever (21) and switch actuating stud (19).

(9) Remove the self-locking hexagonal nut (18) that holds the switch actuating stud to the tape-out alarm lever; remove the switch actuating stud and the flat washer (20).

(10) Remove the three self-locking hexagonal nuts (22) and machine screws (23) that hold the tape reel hub (24) to the tape reel (28); remove the tape reel hub.

(11) Remove the self-locking hexagonal nut (25) and screw (26) that hold the ball bearing (27) and the tape reel (28) to the tape reel bracket; remove the ball bearing and the tape reel.

(12) Unsolder and disconnect the wire leads to the tape-out alarm switch (43). Remove the wire from the clamp (38).

(13) Remove the two self-locking hexagonal nuts (29), machine screws (30), and lock-

washers (31) that hold the plug connector (36) to the tape reel bracket; remove the terminal lug (32).

(14) Remove the two self-locking hexagonal nuts (33) and machine screws (34) that hold the tape alarm buzzer (35) to the tape reel bracket; remove the tape alarm buzzer (35), plug connector (36), and connecting wire. If necessary, remove the tubing (37) from the connecting wire.

(15) Remove the clamp (38) from the tape reel bracket.

(16) Remove the two self-locking hexagonal nuts (39), machine screws (40), and flat washers (41) that hold the tape-out alarm switch (43) to the tape reel bracket; remove the tape-out alarm switch and spacer (42).

(17) Unhook the reel support latch spring (44) from the reel support latch (46) and from the spring post on the tape reel bracket.

(18) Remove the retainer ring (45) that holds the reel support latch (46) to the stud on the tape reel bracket; remove the reel support latch.

(19) Unhook the switch operating lever spring (47) from the switch operating lever (49) and from the spring post on the tape reel bracket (53).

(20) Remove the retainer ring (48) that holds the switch operating lever (49) to the stud on the tape reel bracket (53); remove the switch operating lever.

(21) Unhook the lever latch spring (50) from the lever latch (52) and from the spring post on the tape reel bracket.

(22) Remove the retainer ring (51) that holds the lever latch (52) to the stud on the tape reel bracket; remove the lever latch.

b. Reassembly.

(1) Reassemble the tape reel as indicated in figure 139; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Connect wiring in accordance with figure 131.

(3) Adjust the tape reel as described in paragraph 121.

175. Disassembly and Reassembly of Tape Reel (TT–107B/FG)

(fig. 140)

a. Disassembly.

(1) Disconnect the receptacle connector of the tape-out alarm cable from the plug connector (30) on the switch bracket (54). Lift the assembled tape roll retaining plate (1) and tape reel (8) from the pivot stud bracket (16).

(2) Unlock the tape roll retaining plate (1) from the hub on the tape reel (8); remove the tape roll retaining plate.

(3) Remove the retainer ring (2) that holds the release plunger (3) to the tape reel hub; remove the release plunger and spring (4).

(4) Remove the guide nut (5), lockwasher (6), and pivot stud (7) from the tape reel (8).

(5) Remove the machine screw (9), self-locking hexagonal nut (10), the three machine screws (11), lockwashers (12), and flat washers (13) that hold the tape reel bracket (61) to the reperforator frame; remove the tape reel bracket.

(6) Remove the two machine screws (14) and lockwashers (15) that hold the pivot stud bracket (16) to the tape reel bracket (61); remove the pivot stud bracket.

(7) Unhook the alarm lever spring (17) from the alarm lever (53) and from the spring post on the tape reel bracket (61).

(8) Remove the self-locking hexagonal nut (18) and machine screw (19) that hold the cable clamp (20) to the tape reel bracket (61); remove the cable clamp.

(9) Disconnect the wire leads of the tape-out alarm cable assembly (28) from the tape-out alarm switch (36) and from the plug connector (30).

(10) Remove the two self-locking hexagonal nuts (21) and machine screws (22) that hold the switch bracket (54) to the tape reel bracket (61); remove the assembled switch bracket and the cable clamp (23).

(11) Remove the plastic tubing (24) from the tape-out alarm cable assembly (28).

(12) Remove the two self-locking hexagonal nuts (25) and machine screws (26) that hold the tape alarm buzzer (27) to the

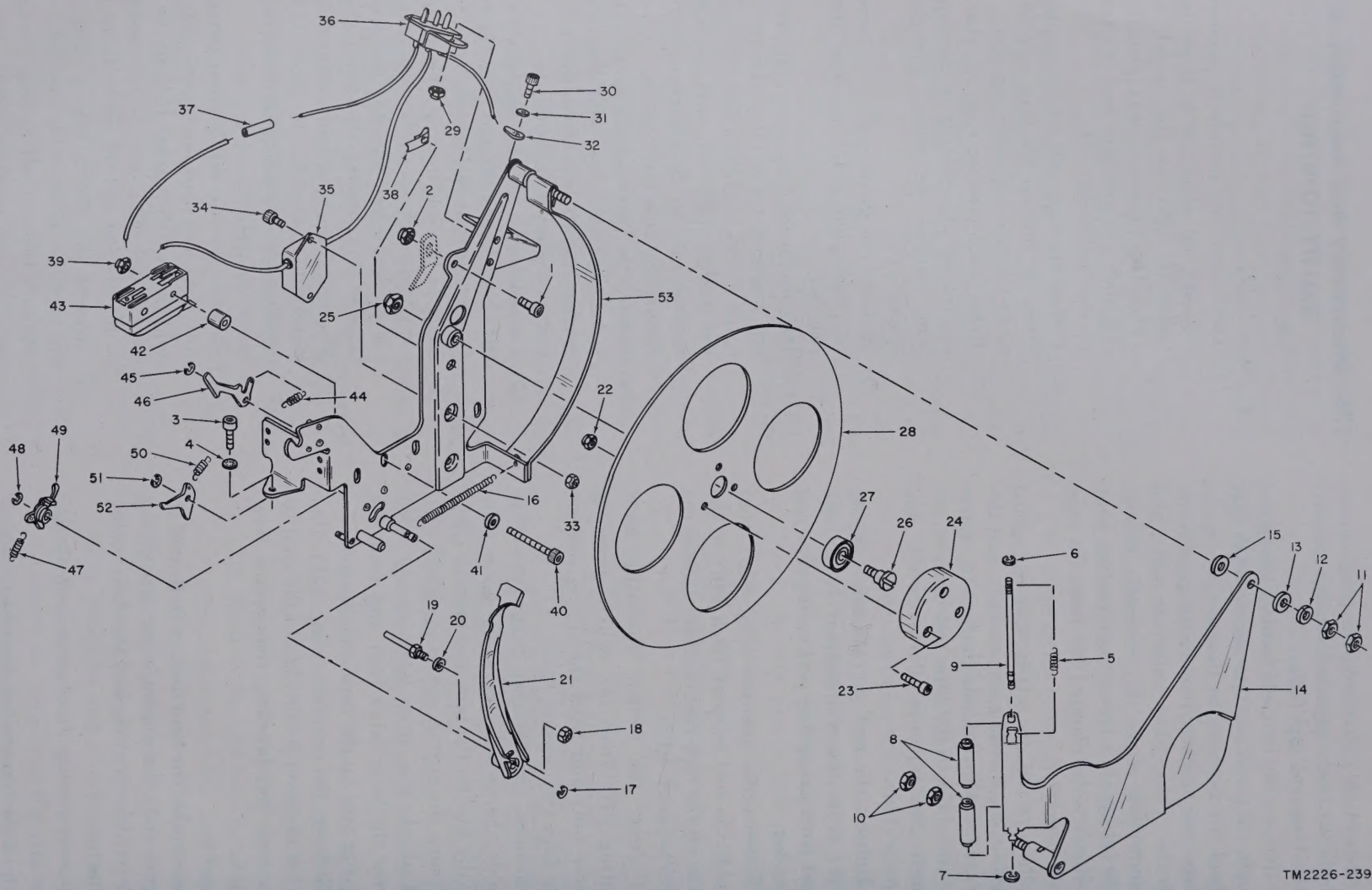


Figure 139. Tape reel, exploded view (TT–107/FG).

1 Machine screw, 10015
2 Self-locking hexagonal nut, 10525
3 Machine screw, 10024–01
4 Lockwasher, 10405
5 Spring, 52212
6 Retainer ring, 10969
7 Retainer ring, 10969
8 Guide roller, 50162
9 Tape guide roller shaft, 53159
10 Plain hexagonal nut, 10509
11 Plain hexagonal nut, 10509
12 Lockwasher, 10431
13 Flat washer, 53783
14 Outer reel support arm, 52540A
15 Flat washer, 53783
16 Alarm lever spring, 52576
17 Retainer ring, 10949
18 Self-locking hexagonal nut, 10500
19 Switch actuating stud, 522278
20 Flat washer, 10450
21 Tape-out alarm lever, 52542A
22 Self-locking hexagonal nut, 10500
23 Machine screw, 10006
24 Tape reel hub, 52128
25 Self-locking hexagonal nut, 10525
26 Screw, 52541
27 Ball bearing, 10762
28 Tape reel, 52296
29 Self-locking hexagonal nut, 10500
30 Machine screw, 10003
31 Lockwasher, 10458
32 Terminal lug, 20807
33 Self-locking hexagonal nut, 10500
34 Machine screw, 10003
35 Tape alarm buzzer, 20783
36 Plug connector, 20265
37 Tubing, 20837
38 Clamp, 20511
39 Self-locking hexagonal nut, 10500
40 Machine screw, 10033
41 Flat washer, 10450
42 Spacer, 52272
43 Tape-out alarm switch, 20108
44 Reel support latch spring, 50912
45 Retainer ring, 10949
46 Reel support latch, 52938
47 Switch operating lever spring, 52266
48 Retainer ring, 10949
49 Switch operating lever, 52279A
50 Lever latch spring, 52212
51 Retainer ring, 10949
52 Lever latch, 52281
53 Tape reel bracket, 52140A

Figure 139—Continued

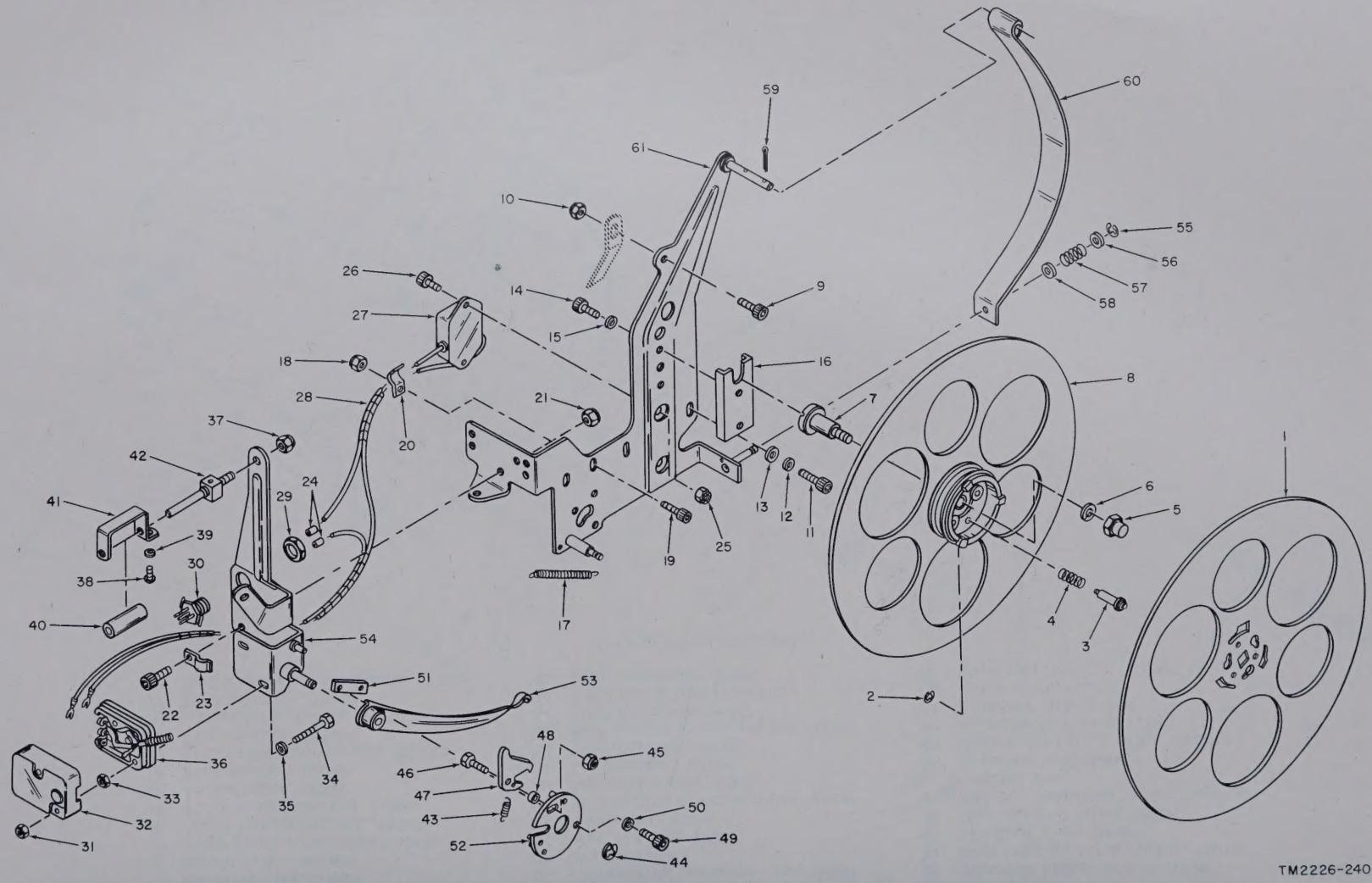


Figure 140. Tape reel, exploded view (TT-107B/FG).

1 Tape roll retaining plate, 57351
2 Retainer ring, 10969
3 Release plunger, 57389
4 Spring, 57391
5 Guide nut, 57314
6 Lockwasher, 10431
7 Pivot stud, 57390
8 Tape reel, 57350A
9 Machine screw, 10015
10 Self-locking hexagonal nut, 10525
11 Machine screw, 10024–01
12 Lockwasher, 10431
13 Flat washer, 10473
14 Machine screw, 10008
15 Lockwasher, 10430
16 Pivot stud bracket, 57377
17 Alarm lever spring, 57394
18 Self-locking hexagonal nut, 10501
19 Machine screw, 10025
20 Cable clamp, 20521
21 Self-locking hexagonal nut, 10501
22 Machine screw, 10025
23 Cable clamp, 20521
24 Tubing, 20732
25 Self-locking hexagonal nut, 10500
26 Machine screw, 10004
27 Tape-alarm buzzer, 20783
28 Tape-out alarm cable assembly, 57650A (includes item 27)
29 Plain hexagonal nut
30 Plug connector, 20272 (includes item 29)
31 Self-locking hexagonal nut, 10500
32 Alarm switch cover, 55372A
33 Hexagonal nut, 10513
34 Machine screw, 10091
35 Lockwasher, 10429
36 Tape-out alarm switch, 56821A
37 Self-locking hexagonal nut, 10525
38 Machine screw, 10357
39 Lockwasher, 10429
40 Guide roller, 50162
41 Retainer, 57379
42 Tape guide roller stud, 57378
43 Lever latch spring, 53312
44 Retainer ring, 10949
45 Self-locking hexagonal nut, 10500
46 Machine screw, 10090
47 Lever latch, 57395
48 Spacer, 57380
49 Machine screw, 10003
50 Lockwasher, 10429
51 Nut plate, 52561
52 Switch operating plate, 57374A
53 Alarm lever, 57397A
54 Switch bracket, 57371A
55 Retainer ring, 10960
56 Flat washer, 50319
57 Tape retainer spring, 57391
58 Flat washer, 50319
59 Cotter pin, 10802
60 Tape retainer, 57392
61 Tape reel bracket, 57367A

Figure 140—Continued

tape reel bracket (61); remove the tape alarm buzzer, and the tape-out alarm cable assembly (28). Remove the plain hexagonal nut (29) and plug connector (30).

(13) Remove the two self-locking hexagonal nuts (31) that retain the alarm switch cover (32); remove the alarm switch cover (32).

(14) Remove the two hexagonal nuts (33), machine screws (34), and lockwashers (35) that hold the tape-out alarm switch (36) to the switch bracket (54); remove the tape-out alarm switch (36).

(15) Remove the two self-locking hexagonal nuts (37) that hold the two tape guide roller studs (42) to the switch bracket (54); remove the two guide roller assemblies.

(16) Remove the two machine screws (38) and lockwashers (39) that hold the two retainers (41) to the two tape guide roller studs (42); remove the guide roller (40) and retainer (41) from each of the tape guide roller studs (42).

(17) Unhook the lever latch spring (43) from the switch operating plates (52) and from the lever latch (47).

(18) Remove the retainer ring (44) that holds the switch operating plate (52) to the stud on the switch bracket (54); remove the assembled switch operating plate, lever latch (47), and alarm lever (53).

(19) Remove the self-locking hexagonal nut (45) and machine screw (46) that hold the lever latch (47) to the switch operating plate (52); remove the lever latch (47) and spacer (48).

(20) Remove the machine screw (49), lockwasher (50), and nut plate (51) that hold the switch operating plate (52) to the alarm lever (53); remove the switch operating plate (52).

(21) Remove the retainer ring (55), flat washer (56), tape retainer spring (57), and flat washer (58) that hold the tape retainer (60) to the stud on the tape reel bracket (61). Remove the two cotter pins (59) from the stud at the top of the tape reel bracket; remove the tape retainer.

b. Reassembly.

(1) Reassemble the tape reel as indicated in figure 140; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Connect wiring in accordance with figure 132.

(3) Adjust the tape reel as described in paragraphs 122, 123, and 124.

176. Disassembly and Reassembly of Tape Puller Mechanism (TT–107B/FG)

(fig. 141)

a. Disassembly.

(1) Remove the two machine screws (1), flat washers (2), and lockwashers (3) that hold the tape puller bracket (17) to the front support frame; remove the tape puller assembly.

(2) Remove the tape puller arm roller (4) from the tape puller roller stud (8).

(3) Remove the retainer ring (5) and slide the assembled tape puller arm (13), tape puller spring (12), and tape puller roller stud (8) off the arm pivot stud (15). Remove the flat washer (6) from the arm pivot stud.

(4) Remove the self-locking hexagonal nut (7) that holds the tape puller roller stud (8) to the tape puller arm (13); remove the tape puller roller stud.

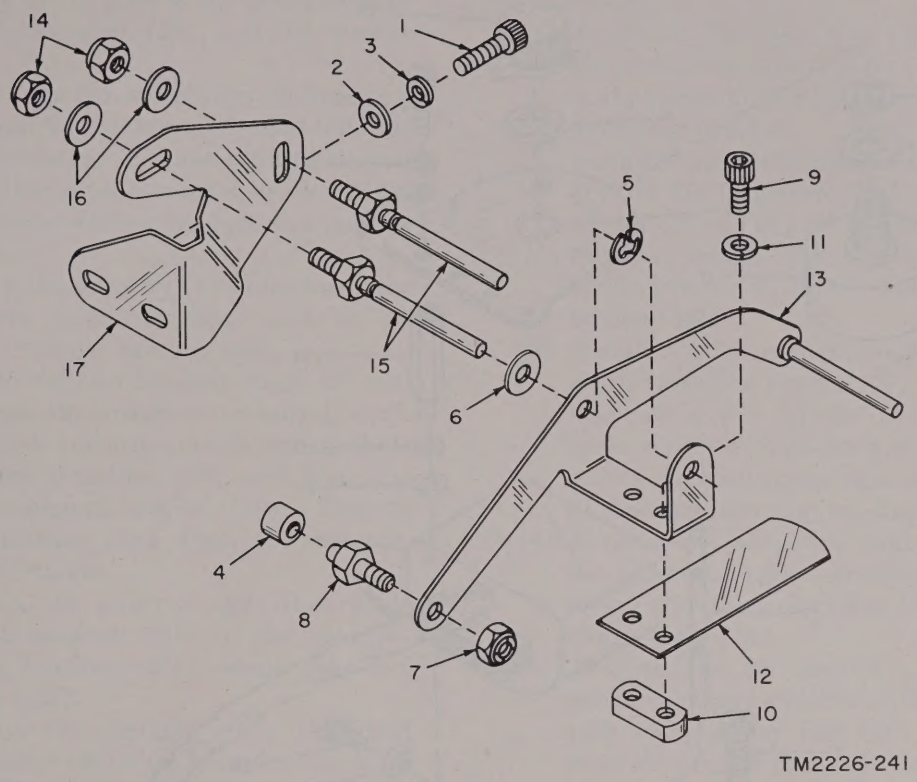
(5) Remove the two machine screws (9), the nut plate (10), and two lockwashers (11) that hold the tape puller spring (12) to the tape puller arm (13); remove the tape puller spring.

(6) Remove the two self-locking hexagonal nuts (14) that hold the arm pivot studs (15) to the tape puller bracket (17); remove the arm pivot studs and flat washers (16).

b. Reassembly.

(1) Reassemble the tape puller mechanism as indicated in figure 141; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the tape puller mechanism as described in paragraph 119.



1 Machine screw, 10008
2 Flat washer, 10454
3 Lockwasher, 10430
4 Tape puller arm roller, 50843
5 Retainer ring, 10949
6 Flat washer, 50827
7 Self-locking hexagonal nut, 10501
8 Tape puller roller stud, 56539
9 Machine screw, 10003
10 Nut plate, 54884
11 Lockwasher, 10429
12 Tape puller spring, 56540
13 Tape puller arm, 56536A
14 Self-locking hexagonal nut, 10501
15 Arm pivot stud, 56538
16 Flat washer, 50827
17 Tape puller bracket, 56541

Figure 141. Tape puller mechanism, exploded view (TT–107B/FG).

177. Disassembly and Reassembly of Selector Magnet (TT–107/FG)

(fig. 142)

a. Disassembly.

(1) Unplug the selector-magnet cable from the receptacle connector at the right front of the base frame.

(2) Remove the two machine screws (1) and lockwashers (2) that hold the cable clamps (3) to the reperforator frame. Remove the machine screw (4) and lockwasher (5) that hold the cable clamp (6) to the selector-magnet bracket (42). Remove the two cable clamps (3 and 6) from the cable of the selector magnet (22).

(3) Remove the two machine screws (7), lockwashers (8), and flat washers (9) that attach the selector-magnet bracket (42) to the reperforator frame; remove the selector-magnet assembly from the reperforator.

(4) Unsolder the two electrical leads from the two terminal lugs on the potentiometer (17); tag the leads. Remove the two pieces of insulating tubing (10) from the electrical leads at the potentiometer (17).

(5) Remove the two machine screws (11) and lockwashers (12) that hold the potentiometer mounting bracket (18) and cable shield terminal to the studs (19); remove the assembled potentiometer (17) and potentiometer mounting bracket (18).

(6) Remove the knob (13) and plain hexagonal nut (14) that hold the potentiometer (17) to the potentiometer mounting

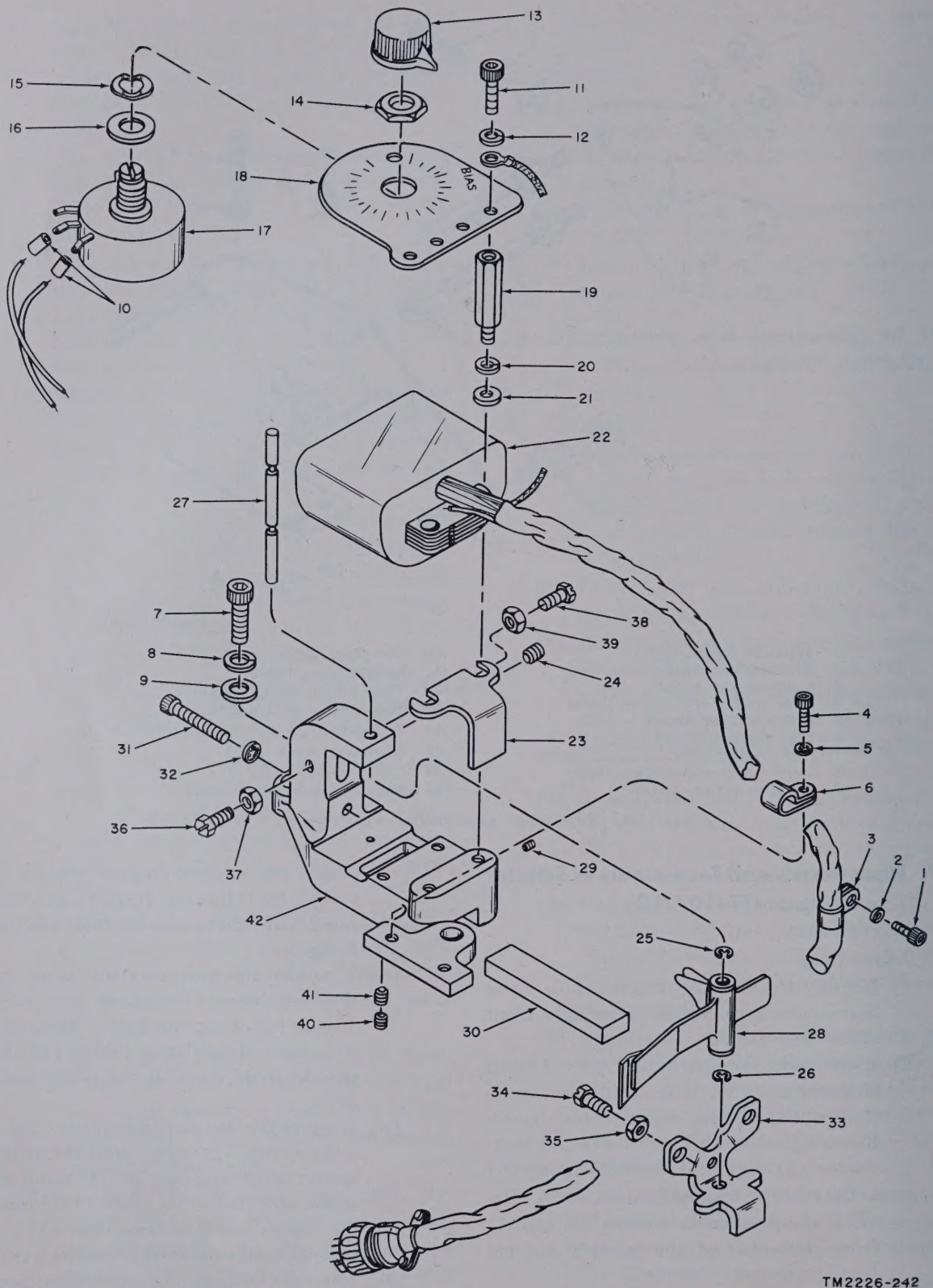


Figure 142. Selector magnet, exploded view (TT–107/FG).

bracket (18); remove the potentiometer (17), lockwasher (15), and flat washer (16).

(7) Remove the two studs (19), lockwashers (20), and flat washers (21) that hold the magnet bracket (23) and selector magnet (22) to the selector-magnet bracket (42); remove the selector magnet and magnet bracket.

(8) Remove the setscrew (24) that holds the armature mounting shaft (27) in the selector-magnet bracket (42).

(9) Remove the two retainer rings (25 and 26) from the armature mounting shaft (27); slide the armature mounting shaft from the armature (28) and from the selector-magnet bracket (42). Remove the armature (28) from the selector-magnet bracket.

(10) Remove the setscrew (29) that holds the bar magnet (30) in the selector-magnet bracket (42); remove the bar magnet (30).

(11) Remove the machine screw (31) and lockwasher (32) that hold the armature stop bracket (33) on the selector-magnet bracket (42); remove the assembled armature stop bracket (33), machine screws (34), and plain hexagonal nuts (35).

(12) Remove the two machine screws (34) and plain hexagonal nuts (35) from the armature stop bracket (33).

(13) Remove the two armature leaf spring stop screws (36 and 38) and plain hexagonal nuts (37 and 39) from the selector-magnet bracket (42).

(14) Remove the setscrews (40 and 41) from the selector-magnet bracket (42).

b. Reassembly.

(1) Install the four setscrews (41 and 40) in the selector-magnet bracket (42) with the leading ends flush with the surface of the mounting bracket.

(2) Install the plain hexagonal nuts (39 and 37) on the armature leaf spring stop screws (38 and 36) about halfway up the threads; install the leaf spring stop screws (38 and 36) in the selector-magnet bracket (42).

(3) Install the plain hexagonal nuts (35) on the machine screws (34); install the machine screws in the armature stop bracket (33) with the ends of the machine screws approximately flush with the face of the armature stop bracket.

(4) Replace the armature stop bracket on the selector-magnet bracket (42) and secure with the lockwasher (32) and machine screw (31).

(5) Position the bar magnet (30) on the selector-magnet bracket with the north pole (marked by red dot) protruding from the magnet bracket. Refer to paragraph 101 for adjustment and positioning the bar magnet. Secure the bar magnet (30) with a setscrew (29).

(6) Reassemble the selector magnet by reversing the sequence of disassembly outlined in steps (7) through (9) in *a* above.

(7) Adjust the selector magnet as described in paragraphs 100, 102, 104, and 106.

(8) Reassemble and install the selector magnet on the reperforator by reversing the sequence of disassembly outlined in (i) through (6) in *a* above.

(9) Adjust the selector magnet as described in paragraphs 108, 110, and 111.

---

1 Machine screw, 10005
2 Lockwasher, 10429
3 Cable clamp, 20513
4 Machine screw, 10008
5 Lockwasher, 10430
6 Cable clamp, 20513
7 Machine screw, 10018
8 Lockwasher, 10420
9 Flat washer, 10464
10 Tubing, 20732
11 Machine screw, 10032
12 Lockwasher, 10430
13 Knob, 20815
14 Plain hexagonal nut, 10529
15 Lockwasher, 10419
16 Flat washer, 10468
17 Potentiometer, 20021
18 Potentiometer mounting bracket, 53333
19 Stud, 53597
20 Lockwasher, 10430
21 Flat washer, 50315
22 Selector magnet, 53550A
23 Bracket, 52296
24 Setscrew, 10225
25 Retainer ring, 10969
26 Retainer ring, 10969
27 Armature mounting shaft, 52288
28 Armature, 53103A
29 Setscrew, 10220
30 Bar magnet, 52289
31 Machine screw, 10010
32 Lockwasher, 10404
33 Armature stop bracket, 52529
34 Machine screw, 53183
35 Plain hexagonal nut, 10507
36 Armature leaf spring stop screw, 53183
37 Plain hexagonal nut, 10507
38 Armature leaf spring stop screw, 53183
39 Plain hexagonal nut, 10507
40 Setscrew, 10221
41 Setscrew, 10235
42 Selector-magnet bracket, 52528

Figure 142—Continued

178. Disassembly and Reassembly of Selector Magnet (TT–107B/FG)

(fig. 143)

a. Disassembly.

(1) Unplug the selector magnet cable (24) from the receptacle connector at the right front of the base frame.

(2) Remove the machine screw (1) and lockwasher (2) that hold the cable clamp (3) to the reperforator frame. Remove the machine screw (4) and lockwasher (5) that hold the cable clamp (6) to the selector-magnet bracket (51).

(3) Remove the machine screw (7) and lockwashers (8 and 9) that hold the grounding lug on the selector-magnet cable to the reperforator frame.

(4) Remove the two machine screws (10), lockwashers (11), and flat washers (12) that hold the selector-magnet bracket to the reperforator frame; remove the selector-magnet assembly from the reperforator.

(5) Unsolder the two electrical leads from the terminal lugs on the potentiometer (19); tag the leads. Remove the two pieces of insulating tubing (13) from the electrical leads at the potentiometer.

(6) Remove the two machine screws (14) and lockwashers (15) that hold the potentiometer mounting bracket (20) to the studs (25 and 28); remove the assembled potentiometer and mounting bracket.

(7) Remove the two plain hexagonal nuts (16 and 17) that hold the potentiometer to the potentiometer mounting bracket; remove the potentiometer and lockwasher (18).

(8) Remove the two cotter pins (21) that hold the cover (22) on the two studs of the selector magnet (31); remove the cover and the two cover springs (23).

(9) Unsolder the eight electrical wire leads of the selector-magnet cable (24) from the eight terminal posts of the selector magnet; tag the leads.

(10) Remove the stud (25), lockwasher (26), cable clamp (27), stud (28), lockwasher (29), and flat washer (30) that hold the magnet bracket (32) and selector magnet to the selector-magnet bracket; remove the selector magnet and magnet bracket. Remove the selector-magnet cable (24) from the cable clamps (3, 6, and 27).

(11) Remove the setscrew (33) that holds the armature mounting shaft (36) in the selector-magnet bracket.

(12) Remove the two retainer rings (34 and 35) from the armature mounting shaft; slide the armature mounting shaft from the armature (37) and from the selector-magnet bracket; remove the armature from the selector-magnet bracket.

(13) Remove the setscrew (38) that holds the bar magnet (39) in the selector-magnet bracket; remove the bar magnet.

(14) Remove the machine screw (40) and lockwasher (41) that hold the armature stop bracket (42) on the selector-magnet bracket (51); remove the assembled armature stop bracket, machine screws (43), and plain hexagonal nuts (44).

---

1 Machine screw, 10005
2 Lockwasher, 10429
3 Cable clamp, 20513
4 Machine screw, 10008
5 Lockwasher, 10430
6 Cable clamp, 20513
7 Machine screw, 10022
8 Lockwasher, 10404
9 Lockwasher, 10430
10 Machine screw, 10005
11 Lockwasher, 10429
12 Flat washer, 10464
13 Tubing, 20732
14 Machine screw, 10032
15 Lockwasher, 10430
16 Plain hexagonal nut, 10529
17 Plain hexagonal nut, 10529
18 Lockwasher, 10419
19 Potentiometer, 20021
20 Potentiometer mounting bracket, 53333
21 Cotter pin, 10806
22 Cover, 56089
23 Cover spring, 56091
24 Selector-magnet cable, 57654A
25 Stud, 53597
26 Lockwasher, 10430
27 Cable clamp, 20513
28 Stud, 53597
29 Lockwasher, 10430
30 Flat washer, 50315
31 Selector magnet, 56126A
32 Magnet bracket, 52292
33 Setscrew, 10225
34 Retainer ring, 10969
35 Retainer ring, 10969
36 Armature mounting shaft, 52288
37 Armature, 54092A
38 Setscrew, 10220
39 Bar magnet, 52289
40 Machine screw, 10010
41 Lockwasher, 10404
42 Armature stop bracket, 52529
43 Machine screw, 53183
44 Plain hexagonal nut, 10507
45 Armature leaf spring stop screw, 53183
46 Plain hexagonal nut, 10507
47 Armature leaf spring stop screw, 53183
48 Plain hexagonal nut, 10507
49 Setscrew, 10221
50 Setscrew, 10235
51 Selector-magnet bracket, 52528

Figure 143—Continued

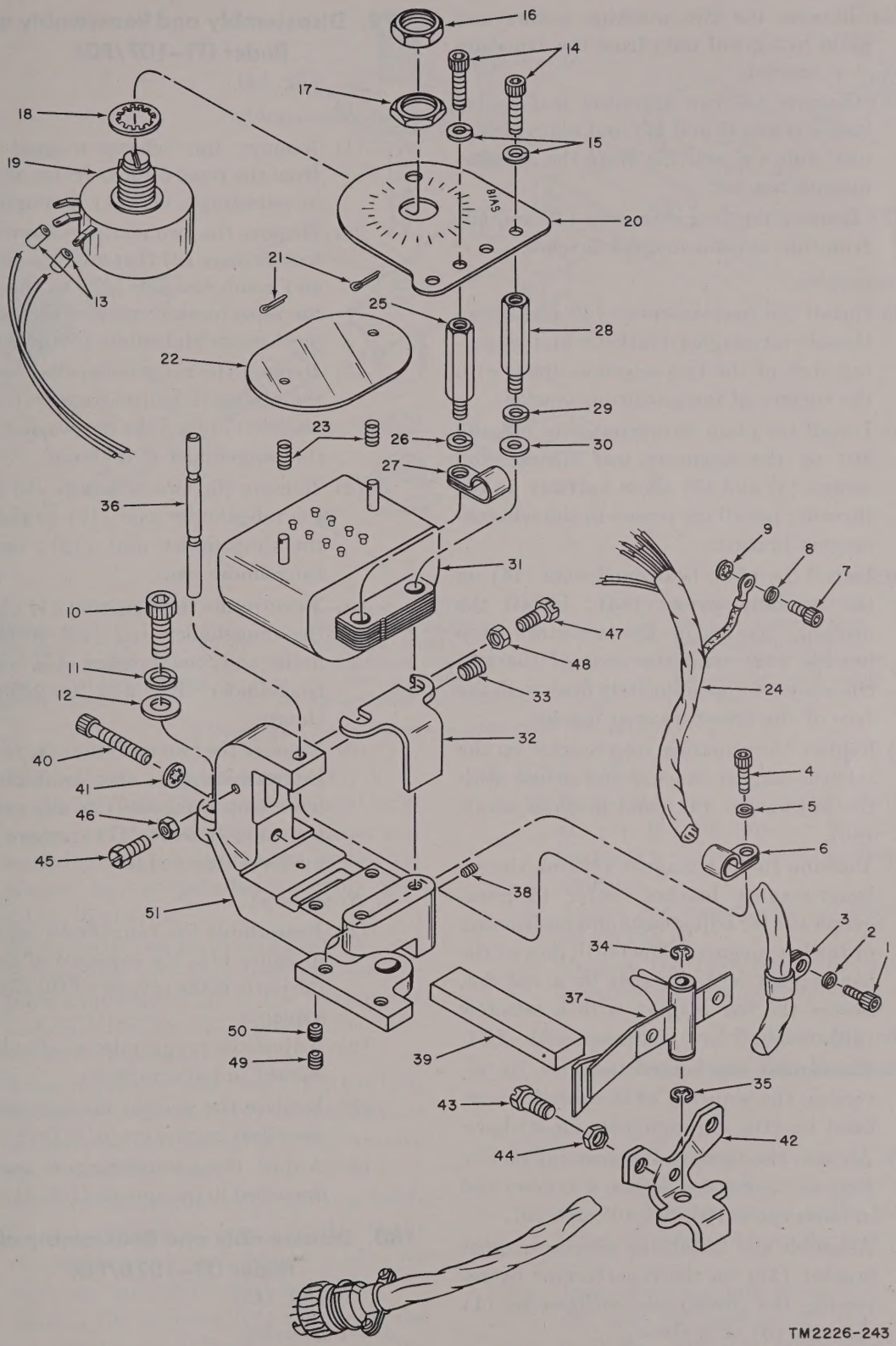


Figure 143. Selector magnet, exploded view (TT–107/FG).

(15) Remove the two machine screws and plain hexagonal nuts from the armature stop bracket.

(16) Remove the two armature leaf spring stop screws (45 and 47) and plain hexagonal nuts (46 and 48) from the selector-magnet bracket.

(17) Remove the four setscrews (49 and 50) from the selector-magnet bracket.

b. Reassembly.

(1) Install the four setscrews (49 and 50) in the selector-magnet-bracket with the leading ends of the two setscrews flush with the surface of the mounting bracket.

(2) Install the plain hexagonal nuts (48 and 46) on the armature leaf spring stop screws (47 and 45) about halfway up the threads; install the screws in the selector-magnet bracket.

(3) Install the plain hexagonal nuts (44) on the machine screws (43); install the machine screws in the armature stop bracket (42) with the ends of the machine screws approximately flush with the face of the armature stop bracket.

(4) Replace the armature stop bracket on the selector-magnet bracket and secure with the lockwasher (41) and machine screw (40).

(5) Position the bar magnet (39) on the selector-magnet bracket; refer to paragraph 101 for adjustment and positioning of the bar magnet. The north pole of the bar magnet is designated by a red dot. Secure the bar magnet with a setscrew (38).

(6) Reassemble the selector magnet by reversing the sequence of disassembly outlined in (10) through (14) in *a* above.

(7) Adjust the selector-magnet attractive force and armature clearance as described in paragraphs 100, 103, 105, and 107.

(8) Assemble and install the selector-magnet bracket (51) on the reperforator by reversing the procedures outlined in (1) through (9) in *a* above.

(9) Adjust the selector magnet as described in paragraphs 109, 110, and 111.

179. Disassembly and Reassembly of Rangefinder (TT–107/FG)

(fig. 144)

a. Disassembly.

(1) Remove the selector-magnet assembly from the reperforator frame as described in paragraph 177*a*(1) through (3).

(2) Remove the two machine screws (1) and lockwashers (2) that hold the rangefinder and comb bracket (17) to the frame of the reperforator; remove the rangefinder mechanism and shims (3 and 4).

(3) Remove the rangefinder dial lock (5), or the alternate knurled nut (6) and lockwasher (7), and the flat washer (8) from the rangefinder dial clamp.

(4) Remove the two setscrews (9) that hold the rangefinder cam (10) to the shaft on the rangefinder dial (12); remove the rangefinder cam.

(5) Remove the retainer ring (11) that holds the rangefinder dial (12) to the rangefinder and comb bracket (17); remove the rangefinder dial and rangefinder dial clamp.

(6) Remove the two machine screws (14) and lockwashers (15) that hold the selector lever stop comb (16) to the rangefinder and comb bracket (17); remove the selector lever stop comb.

b. Reassembly.

(1) Reassemble the rangefinder as indicated in figure 144; the sequence of assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the rangefinder mechanism as described in paragraph 68.

(3) Replace the selector-magnet assembly as described in paragraph 177*b*(8).

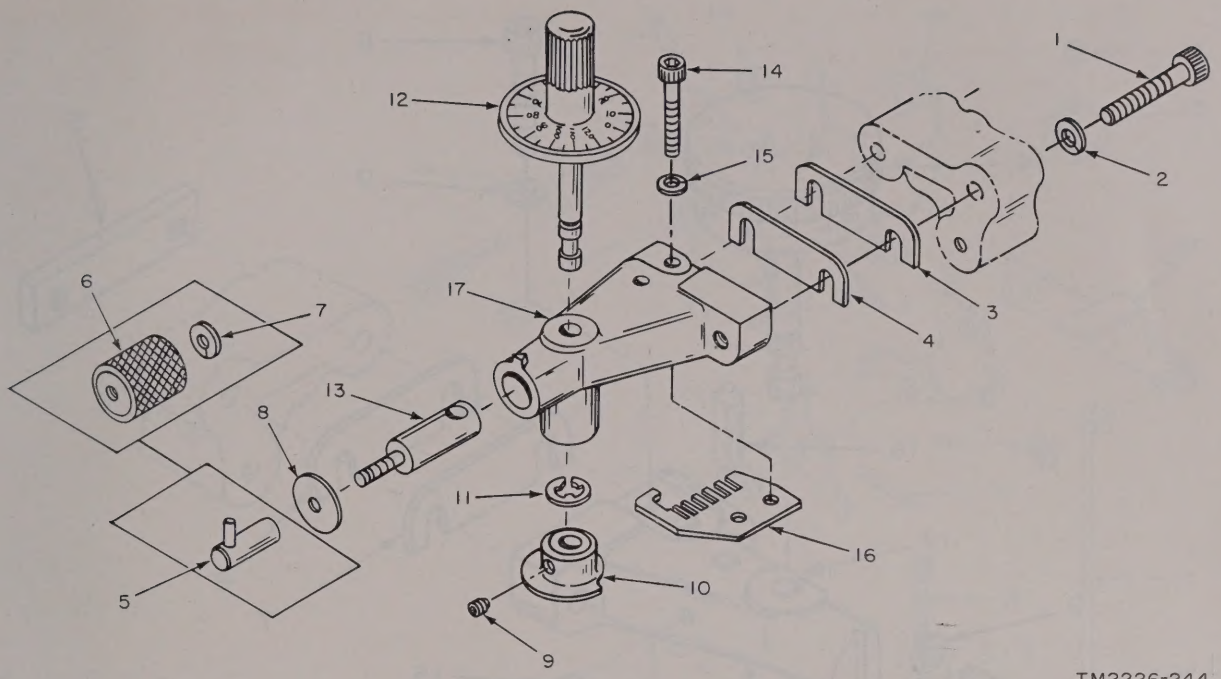
(4) Adjust the selector-magnet assembly as described in paragraphs 108, 110, and 111.

180. Disassembly and Reassembly of Rangefinder (TT–107B/FG)

(fig. 145)

a. Disassembly.

(1) Remove the tape puller mechanism as described in paragraph 176*a*(1).



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1	Machine screw, 10029	7	Lockwasher, 52179	13	Rangefinder dial clamp, 52323
2	Lockwasher, 10431	8	Flat washer, 51555	14	Machine screw, 10046
3	.002-inch shim, 52578	9	Setscrew, 10201	15	Lockwasher, 10429
4	.005-inch shim, 52577	10	Rangefinder cam, 50317	16	Selector lever stop comb, 50511
5	Rangefinder dial lock, 50895A	11	Retainer ring, 10949	17	Rangefinder and comb bracket. 52326
6	Knurled nut, 53819	12	Rangefinder dial, 52381A		

Figure 144. Rangefinder, exploded view (TT–107/FG).

(2) Remove the machine screw (1), lockwasher (2), machine screw (3), and lockwasher (4) that hold the rangefinder and comb bracket (17) to the nut plate (5); remove the rangefinder assembly and shims (6 and 7).

(3) Remove the two machine screws (8) and lockwashers (9) that hold the selector lever stop comb (10) to the rangefinder and comb bracket (17); remove the selector lever stop comb.

(4) Remove the two setscrews (11) that hold the rangefinder cam (12) on the shaft of rangefinder dial assembly (14); remove the rangefinder cam.

(5) Remove the retainer ring (13) that holds the rangefinder dial assembly (14) to the rangefinder and comb bracket (17); remove the rangefinder dial assembly.

(6) Remove the setscrew (15) that holds the rangefinder dial detent (16) to the rangefinder and comb bracket (17); remove the rangefinder dial detent.

b. Reassembly.

(1) Reassemble the rangefinder as indicated in figure 145; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the rangefinder as described in paragraph 69.

(3) Replace the tape puller mechanism as described in paragraph 176*b*.

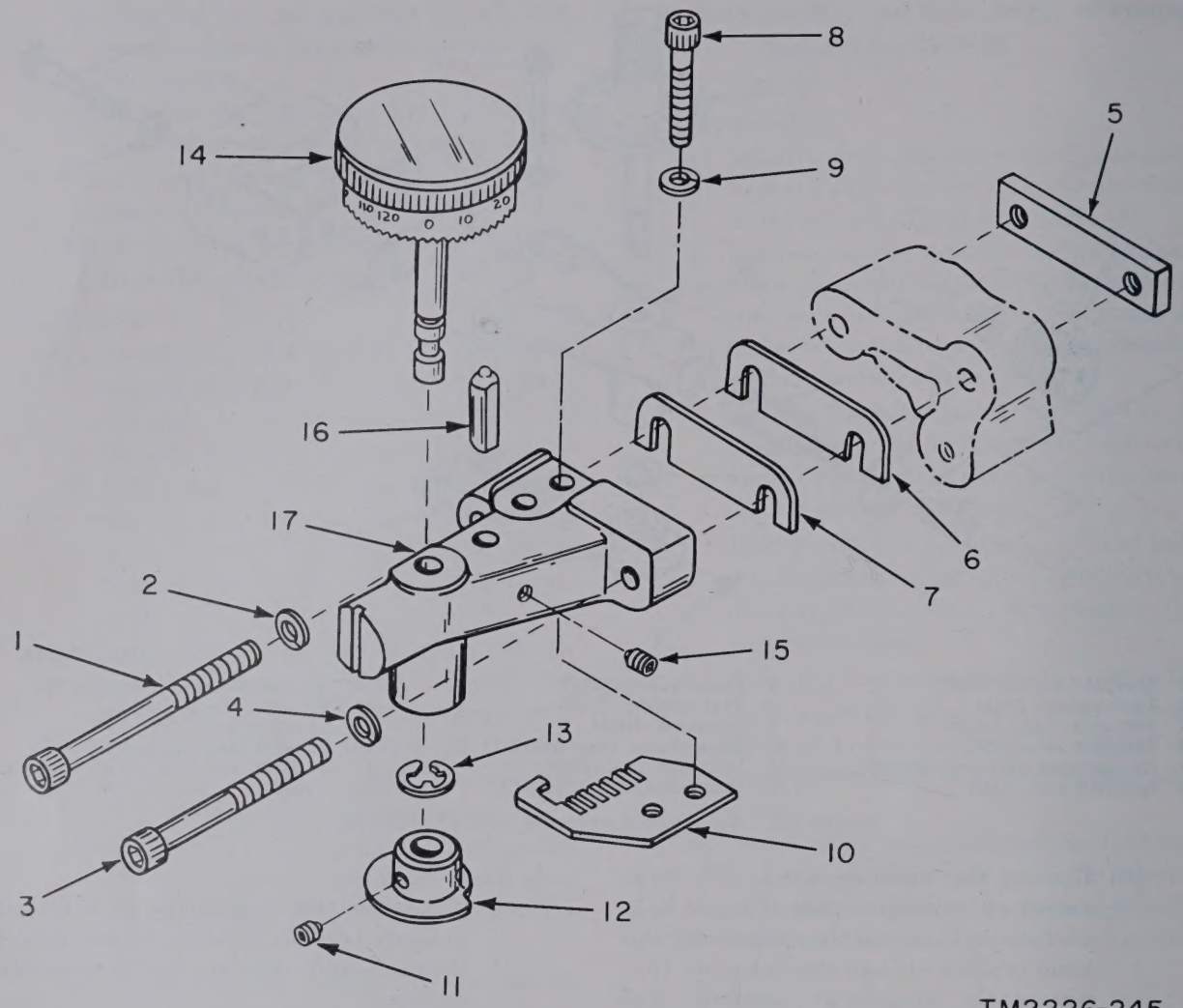
181. Disassembly and Reassembly of Manual Tape Feed-Out Mechanism

(fig. 146)

a. Disassembly.

(1) Remove the machine screw (1), nut plate (2), and flat washer (3) that hold the tape feed-out lever (4) to the tape feed-out shaft (22); remove the tape feed-out lever.

(2) Remove the machine screw (5), nut plate (6), and flat washer (7) that hold the limit stop lever (8) to the tape feed-out shaft (22); remove the limit stop lever and flat washer (9).



1 Machine screw, 10060
2 Lockwasher, 10430
3 Machine screw, 10067
4 Lockwasher, 10430
5 Nut plate, 57165
6 .002-inch shim, 52578
7 .005-inch shim, 52577
8 Machine screw, 10006
9 Lockwasher, 10429
10 Selector lever stop comb, 50511
11 Setscrew, 10201
12 Rangefinder cam, 50317
13 Retainer ring, 10949
14 Rangefinder dial assembly, 57161A
15 Setscrew, 10203
16 Rangefinder dial detent, 53306A
17 Rangefinder and comb bracket, 57163

Figure 145. Reperforator rangefinder, exploded view (TT–107B/FG).

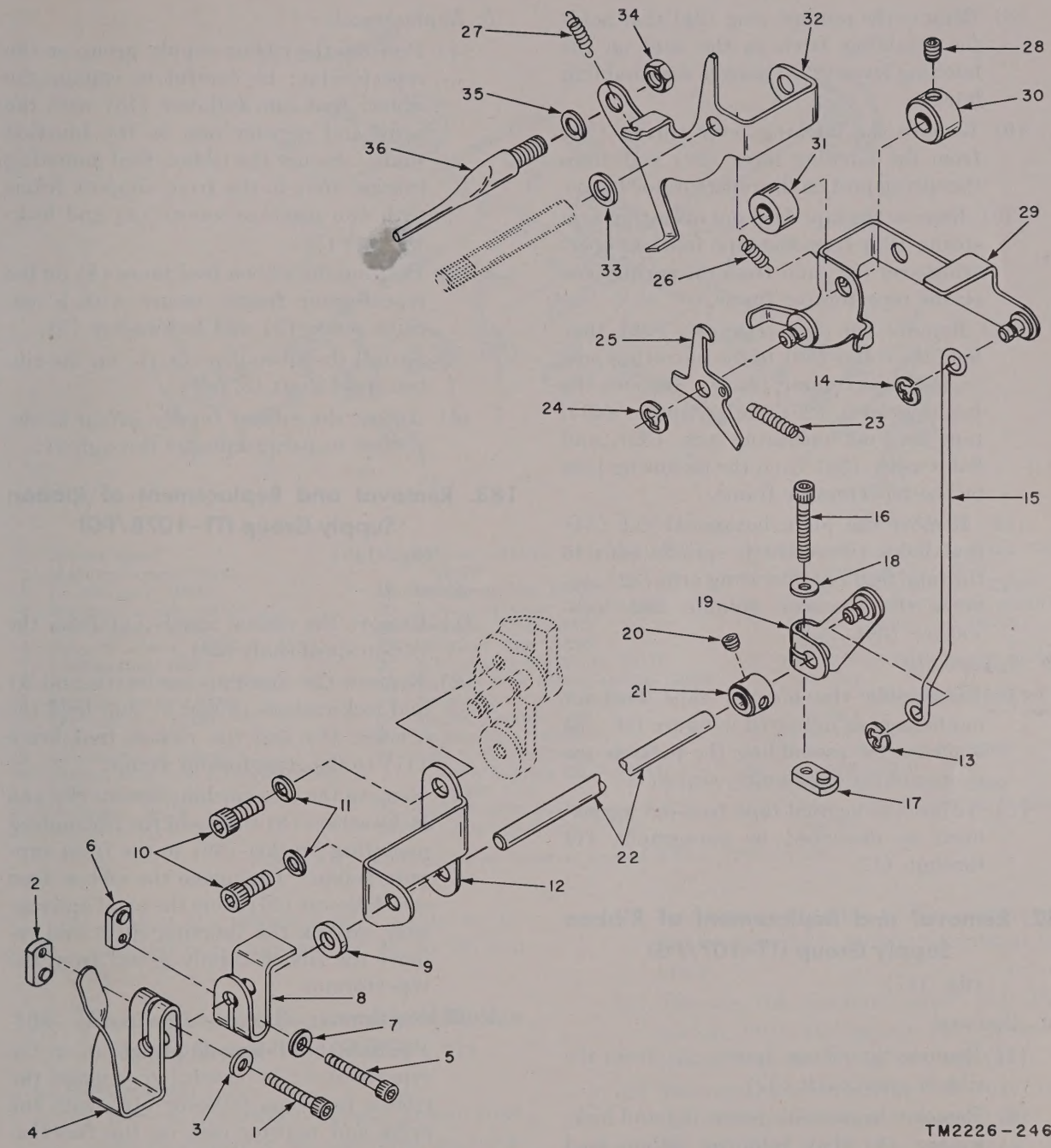
(3) Remove the two machine screws (10) and lockwashers (11) that hold the front support bracket (12) to the tape feed-out shaft (22); remove the front support bracket.

(4) Remove the retainer ring (13) that holds one end of the manual tape feed-out link (15) to the link lever (19). Remove the retainer ring (14) that holds the other end of the manual tape feed-out link to the latching lever (29). Remove the manual tape feed-out link.

(5) Remove the machine screw (16), nut plate (17), and flat washer (18) that hold the link lever (19) to the tape feed-out shaft (22); remove the link lever.

(6) Remove the two setscrews (20) that hold the collar (21) to the tape feed-out shaft (22); remove the collar. Remove the tape feed-out shaft from the reperforator frame.

(7) Remove the latching lever stop spring (23) from the disabling latch (25) and from the latching lever (29).



1 Machine screw, 10006
2 Nut plate, 50174
3 Flat washer, 10459
4 Tape feed-out lever, 52646
5 Machine screw, 10006
6 Nut plate, 50174
7 Flat washer, 10459
8 Limit stop lever, 52211 (TT–107/FG), 56593 (TT–107B/FG)
9 Flat washer, 50827
10 Machine screw, 10035–01
11 Lockwasher, 10405
12 Front support bracket, 52686
13 Retainer ring, 10960
14 Retainer ring, 10960
15 Manual tape feed-out link, 52145
16 Machine screw, 10006
17 Nut plate, 50174
18 Flat washer, 10459
19 Link lever, 52142A
20 Setscrew, 10201
21 Collar, 50391
22 Tape feed-out shaft, 52144
23 Latching lever stop spring, 53141
24 Retainer ring, 10949
25 Disabling latch, 52155
26 Latching lever spring, 53140
27 Tape feed-out operating arm spring, 53139
28 Setscrew, 10208
29 Latching lever, 52152 (TT–107/FG), 56738A (TT–107B/FG)
30 Collar, 50149
31 Spacer, 52157
32 Tape feed-out operating arm, 52149
33 Flat washer, 50544
34 Plain hexagonal nut, 10509
35 Lockwasher, 10431
36 Eccentric spindle, 52151

Figure 146. Manual tape feed-out mechanism, exploded view.

(8) Remove the retainer ring (24) that holds the disabling latch to the stud on the latching lever (29); remove the disabling latch.

(9) Remove the latching lever spring (26) from the latching lever (29) and from the spring post on the reperforator frame.

(10) Remove the tape feed-out operating arm spring (27) from the tape feed-out operating arm (32) and from the spring post on the reperforator frame.

(11) Remove the two setscrews (28) that hold the collar (30) to the mounting post on the reperforator frame. Remove the latching lever (29), collar, spacer (31), tape feed-out operating arm (32), and flat washer (33) from the mounting post on the reperforator frame.

(12) Remove the plain hexagonal nut (34) that holds the eccentric spindle (36) to the tape feed-out operating arm (32); remove the eccentric spindle and lockwasher (35).

b. Reassembly.

(1) Reassemble the manual tape feed-out mechanism as indicated in figure 146; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the manual tape feed-out mechanism as described in paragraphs 114 through 117.

182. Removal and Replacement of Ribbon Supply Group (TT–107/FG)

(fig. 147)

a. Removal.

(1) Remove the ribbon spools (1) from the ribbon spool shaft (37).

(2) Remove the machine screw (2) and lockwasher (3) that hold the ribbon feed brace (8) to the reperforator frame.

(3) Remove the two machine screws (4) and lockwashers (5) that hold the ribbon feed mounting bracket (38) to the front support frame. Disengage the ribbon feed cam follower (13) from the print and register cam on the function shaft and remove the ribbon supply group from the reperforator.

b. Replacement.

(1) Position the ribbon supply group on the reperforator; be careful to engage the ribbon feed cam follower (13) with the print and register cam on the function shaft. Secure the ribbon feed mounting bracket (38) to the front support frame with two machine screws (4) and lockwashers (5).

(2) Position the ribbon feed brace (8) on the reperforator frame; secure with a machine screw (2) and lockwasher (3).

(3) Install the ribbon spools (1) on the ribbon spool shaft (37).

(4) Adjust the ribbon supply group as described in paragraphs 92 through 97.

183. Removal and Replacement of Ribbon Supply Group (TT–107B/FG)

(fig. 148)

a. Removal.

(1) Remove the ribbon spools (1) from the ribbon spool shaft (38).

(2) Remove the machine screws (2 and 4) and lockwashers (3 and 5) that hold the bracket (6) and the ribbon feed brace (11) to the reperforator frame.

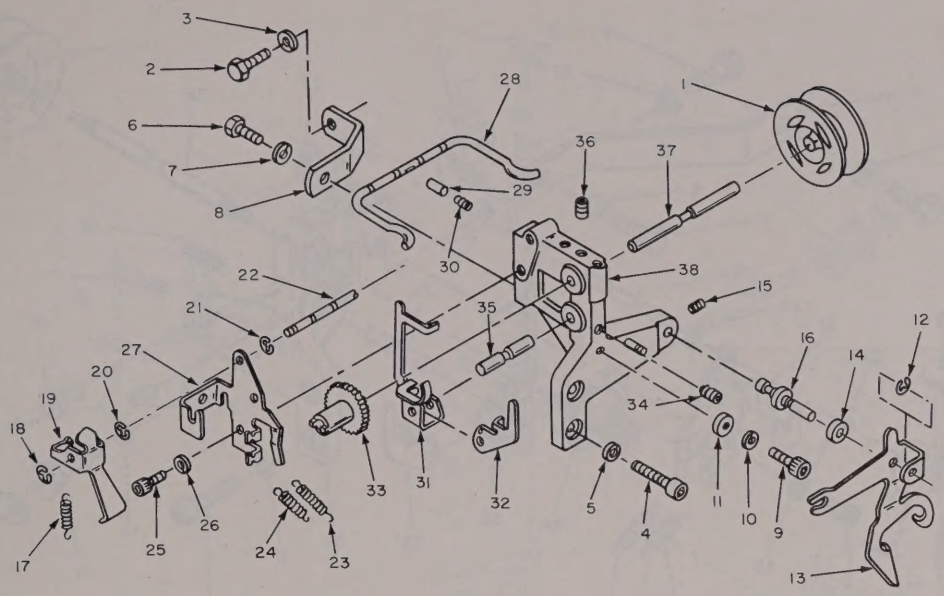
(3) Remove the two machine screws (7) and lockwashers (8) that hold the ribbon feed mounting bracket (39) to the front support frame. Disengage the ribbon feed cam follower (15) from the print and register cam on the function shaft and remove the ribbon supply group from the reperforator.

b. Replacement.

(1) Position the ribbon supply group on the reperforator; be careful to engage the ribbon feed cam follower (15) with the print and register cam on the function shaft. Secure the ribbon feed mounting bracket (39) to the front support frame with the two machine screws (7) and lockwashers (8).

(2) Position the ribbon feed brace (11) and bracket (6) on the reperforator frame; secure with the machine screws (2 and 4) and lockwashers (3 and 5).

(3) Install the ribbon spools (1) on the ribbon spool shaft (38).



1 Ribbon spool
2 Machine screw, 10397
3 Lockwasher, 10431
4 Machine screw, 10028
5 Lockwasher, 10430
6 Machine screw, 10397
7 Lockwasher, 10431
8 Ribbon feed brace, 52581
9 Machine screw, 10008
10 Lockwasher, 10430
11 Spacer, 53334
12 Retainer ring, 10949
13 Ribbon feed cam follower, 52586
14 Spacer, 50827
15 Setscrew, 10210
16 Eccentric stud, 52585
17 Ribbon retainer lever spring, 52603
18 Retainer ring, 10969
19 Ribbon retainer lever, 52708
20 Retainer ring, 10969
21 Retainer ring, 10969
22 Ribbon retainer shaft, 53178
23 Ratchet feed detent spring, 52604
24 Sensing lever spring, 52603
25 Machine screw, 1001
26 Lockwasher, 10429
27 Left holding clip bracket, 52599
Right holding clip bracket, 52594
28 Ribbon spool holding clip, 52615
29 Holding clip detent, 53179
30 Holding clip detent spring, 53256
31 Left sensing lever, 52597
Right sensing lever, 52596
32 Left ratchet feed detent, 52610A
Right ratchet feed detent, 52611A
33 Left ribbon feed detent wheel, 52591A
Right ribbon feed detent wheel, 52590A
34 Setscrew, 10210
35 Sensing lever shaft, 52595
36 Setscrew, 10210
37 Ribbon spool shaft, 52589
38 Ribbon feed mounting bracket, 52512A

Figure 147. Ribbon feed mechanism, exploded view (TT–107/FG).

(4) Adjust the ribbon supply group as described in paragraphs 92, 93, 95, 96, and 97.

184. Disassembly and Reassembly of Ribbon Supply Group (TT–107/FG)

a. Disassembly.

(1) Remove the ribbon supply group from the reperforator as described in paragraph 182*a*.

(2) Some older models of the TT–107/FG may be equipped with ink reservoirs. If an ink reservoir is included, remove the machine screw (1, fig. 149) and lockwasher (2) that hold the ink reservoir (3) to the roller bracket (22); remove the ink reservoir.

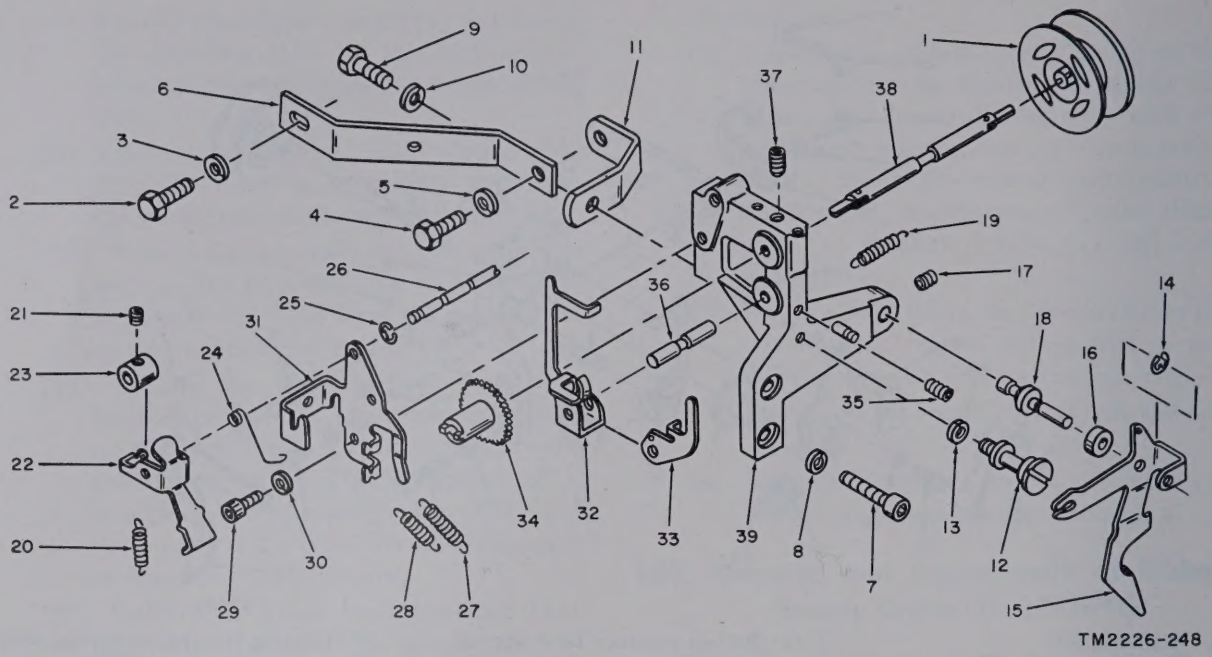
(3) Remove the machine screw (6, fig. 147) and lockwasher (7) that hold the ribbon feed brace (8) to the ribbon feed mounting bracket (38); remove the ribbon feed brace.

(4) Remove the machine screw (9), lockwasher (10), and spacer (11) from the ribbon feed mounting bracket (38).

(5) Remove the retainer ring (12) that holds the ribbon feed cam follower (13) to the eccentric stud (16); remove the ribbon feed cam follower and spacer (14).

(6) Remove the setscrew (15) that holds the eccentric stud (16) to the ribbon feed mounting bracket (38); remove the eccentric stud.

(7) Remove the two ribbon retainer lever springs (17) from the two ribbon retainer levers (19) and the ribbon spool holding clip (28).



1 Ribbon spool
2 Machine screw, 10397
3 Lockwasher, 10431
4 Machine screw, 10089
5 Lockwasher, 10431
6 Bracket, 54076
7 Machine screw, 10028
8 Lockwasher, 10430
9 Machine screw, 10397
10 Lockwasher, 10431
11 Ribbon feed brace, 52581
12 Stud, 57063
13 Lockwasher, 10430
14 Retainer ring 10949
15 Ribbon feed cam follower, 56234
16 Spacer, 50827
17 Setscrew, 10210
18 Eccentric stud, 52585
19 Ribbon feed cam follower spring, 52602
20 Ribbon retainer lever spring, 52603
21 Setscrew, 10201
22 Ribbon retainer lever, 57062
23 Collar, 57061
24 Left sensing lever retracting lever, 57059
Right sensing lever retracting lever, 57060
25 Retainer ring, 10969
26 Ribbon retainer shaft, 53178
27 Ratchet feed detent spring, 52604
28 Sensing lever spring, 52603
29 Machine screw, 10001
30 Lockwasher, 10429
31 Left holding clip bracket, 56226
Right holding clip bracket, 56228
32 Left sensing lever, 52597
Right sensing lever, 52596
33 Left ratchet feed detent, 52610A
Right ratchet feed detent, 52611A
34 Left ribbon feed detent wheel, 52591A
Right ribbon feed detent wheel, 52590A
35 Setscrew, 10210
36 Sensing lever shaft, 52595
37 Setscrew, 10210
38 Ribbon spool shaft, 56231A
39 Ribbon feed mounting bracket, 52512A

Figure 148. Ribbon feed mechanism, exploded view (TT–107B/FG).

(8) Remove the retainer rings (18) that hold the ribbon retainer levers (19) to the ribbon retainer shaft (22); remove the ribbon retainer levers.

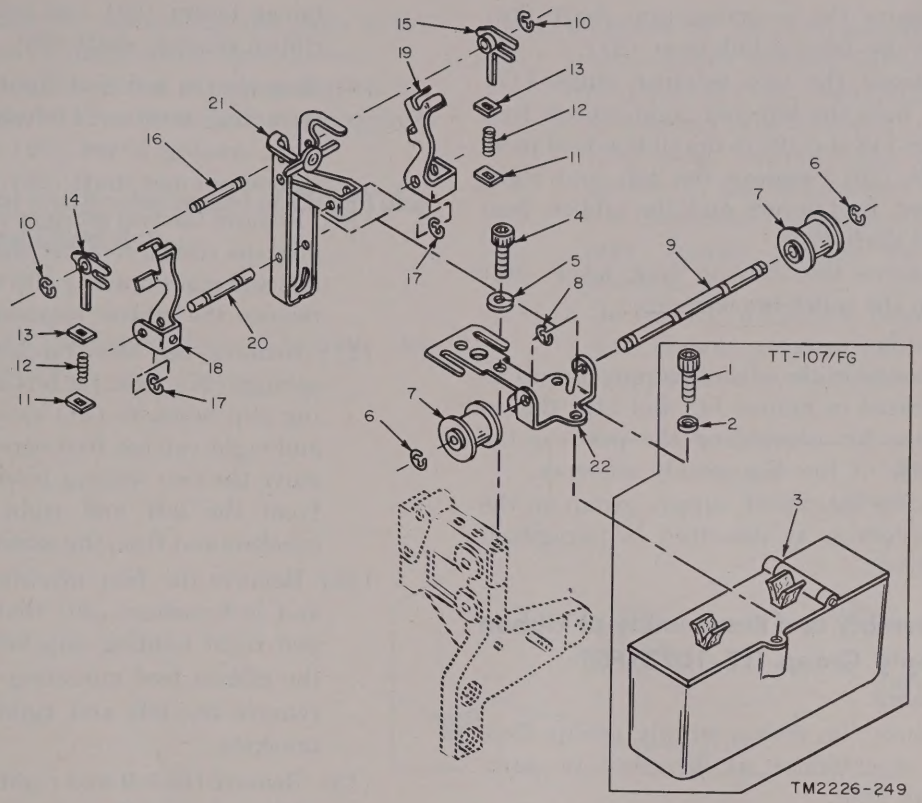
(9) Remove the retainer rings (20 and 21) that hold the ribbon retainer shaft (22) to the left and right holding clip brackets (27); remove the ribbon retainer shaft.

(10) Remove the two ratchet feed detent springs (23) from the left and right holding clip brackets (27) and the left and right ratchet feed detents (32). Remove the two sensing lever springs (24) from the left and right holding clip brackets and the left and right sensing levers (31).

(11) Remove the four machine screws (25) and lockwashers (26) that hold the left and right holding clip brackets (27) to the ribbon feed mounting bracket (38); remove the left and right holding clip brackets.

(12) Remove the ribbon spool holding clip (28) from the left and right holding clip brackets (27); catch the holding clip detent (29) and holding clip detent spring (30) as they are released from the ribbon feed mounting bracket (38).

(13) Remove the left and right sensing levers (31) and the left and right ratchet feed detents (32) from the sensing lever shaft (35). Remove the left and right ribbon



1 Machine screw, 10001 (TT–107/FG)
2 Lockwasher, 10429 (TT–107/FG)
3 Ink reservoir (TT–107/FG)
4 Machine screw, 10008
5 Lockwasher, 10430
6 Retainer ring, 10949
7 Ribbon roller, 52608
8 Retainer ring, 10949
9 Ribbon roller shaft, 52601
10 Retainer ring, 10969
11 Spring washer, 53427
12 Contact plunger spring, 51593
13 Spring washer, 53427
14 Left ribbon reversing arm, 52705A
15 Right ribbon reversing arm, 52704A
16 Reversing arm shaft, 52703
17 Retainer ring, 10969
18 Left ribbon feed lever, 52605
19 Right ribbon feed lever, 52607
20 Ribbon feed pawl shaft, 52609
21 Driving link lever, 52622A
22 Roller bracket, 52598

Figure 149. Upper ribbon feed and reversing mechanism, exploded view.

feed detent wheels (33) from the ribbon spool shaft (37).

(14) Remove the setscrew (34) that holds the sensing lever shaft (35) in the ribbon feed mounting bracket (38); remove the sensing lever shaft.

(15) Remove the setscrew (36) that holds the ribbon spool shaft (37) in the ribbon feed mounting bracket (38); remove the ribbon spool shaft.

(16) Remove the two machine screws (4, fig. 149) and lockwashers (5) that hold the roller bracket (22) to the ribbon feed mounting bracket (38, fig. 147); remove the upper ribbon feed and reversing mechanism from the ribbon feed mounting bracket.

(17) Remove the two retainer rings (6, fig. 149) that hold the two ribbon rollers (7) to the ribbon roller shaft (9); remove the ribbon rollers.

(18) Remove the two retainer rings (8) that hold the ribbon roller shaft (9) to the roller bracket (22); remove the ribbon roller shaft.

(19) Remove the two retainer rings (10) that hold the left and right ribbon reversing arms (14 and 15) to the reversing arm shaft (16); remove the left and right ribbon reversing arms.

(20) Remove the two spring washers (11), contact plunger springs (12), and two spring washers (13) from the left and right ribbon reversing arms (14 and 15).

(21) Remove the reversing arm shaft (16) from the driving link lever (21).

(22) Remove the two retainer rings (17) that hold the left and right ribbon feed levers (18 and 19) to the ribbon feed pawl shaft (20); remove the left and right ribbon feed levers and the ribbon feed pawl shaft (20).

(23) Remove the driving link lever (21) from the roller bracket (22).

b. Reassembly.

(1) Reassemble the ribbon supply group as indicated in figures 148 and 149; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the ribbon supply group on the reperforator as described in paragraph 182*b*.

185. Disassembly and Reassembly of Ribbon Supply Group (TT–107B/FG)

a. Disassembly.

(1) Remove the ribbon supply group from the reperforator as described in paragraph 183*a*.

(2) Remove the machine screw (9, fig. 148) and lockwasher (10) that hold the ribbon feed brace (11) to the ribbon feed mounting bracket (39); remove the ribbon feed brace (11).

(3) Remove the stud (12) and lockwasher (13) from the ribbon feed mounting bracket (39).

(4) Remove the ribbon feed cam follower spring (19) from the ribbon feed cam follower (15) and from the spring post on the ribbon feed mounting bracket.

(5) Remove the retainer ring (14) that holds the ribbon feed cam follower (15) to the eccentric stud (18); remove the ribbon feed cam follower and spacer (16).

(6) Remove the setscrew (17) that holds the eccentric stud (18) to the ribbon feed mounting bracket (39); remove the eccentric stud.

(7) Remove the two ribbon retainer lever springs (20) from the left and right ribbon retainer levers (22) and from the left and right holding clip brackets (31).

(8) Remove the setscrews (21) from the two collars (23); remove the two ribbon retainer levers (22) and collars from the ribbon retainer shaft (26).

(9) Remove the left and right sensing lever retracting levers (24) from the left and right sensing levers (32) and from the ribbon retainer shaft (26).

(10) Remove the two retainer rings (25) that hold the ribbon retainer shaft (26) to the left and right holding clip brackets (31); remove the ribbon retainer shaft.

(11) Remove the two ratchet feed detent springs (27) from the left and right holding clip brackets (31) and from the left and right ratchet feed detents (33). Remove the two sensing lever springs (28) from the left and right holding clip brackets and from the sensing levers (32).

(12) Remove the four machine screws (29) and lockwashers (30) that hold the left and right holding clip brackets (31) to the ribbon feed mounting bracket (39); remove the left and right holding clip brackets.

(13) Remove the left and right sensing levers (32) and the left and right ratchet feed detents (33) from the sensing lever shaft (36). Remove the left and right ribbon feed detent wheels (34) from the ribbon spool shaft (38).

(14) Remove the setscrew (35) that holds the sensing lever shaft (36) in the ribbon feed mounting bracket (39); remove the sensing lever shaft.

(15) Remove the setscrew (37) that holds the ribbon spool shaft (38) in the ribbon feed mounting bracket (39); remove the ribbon spool shaft.

(16) Remove the two machine screws (4, fig. 149) and lockwashers (5) that hold the roller bracket (22) to the ribbon feed mounting bracket (39, fig. 148); remove the upper ribbon feed and reversing mechanism from the ribbon feed mounting bracket.

(17) Complete the disassembly as described in paragraph 184*a*(17) through (23).

b. Reassembly.

(1) Reassemble the ribbon supply group as indicated in figures 147 and 149; the

sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the ribbon supply group on the reperforator as described in paragraph 183*b*.

186. Removal and Replacement of Chad Tube and Chad Box

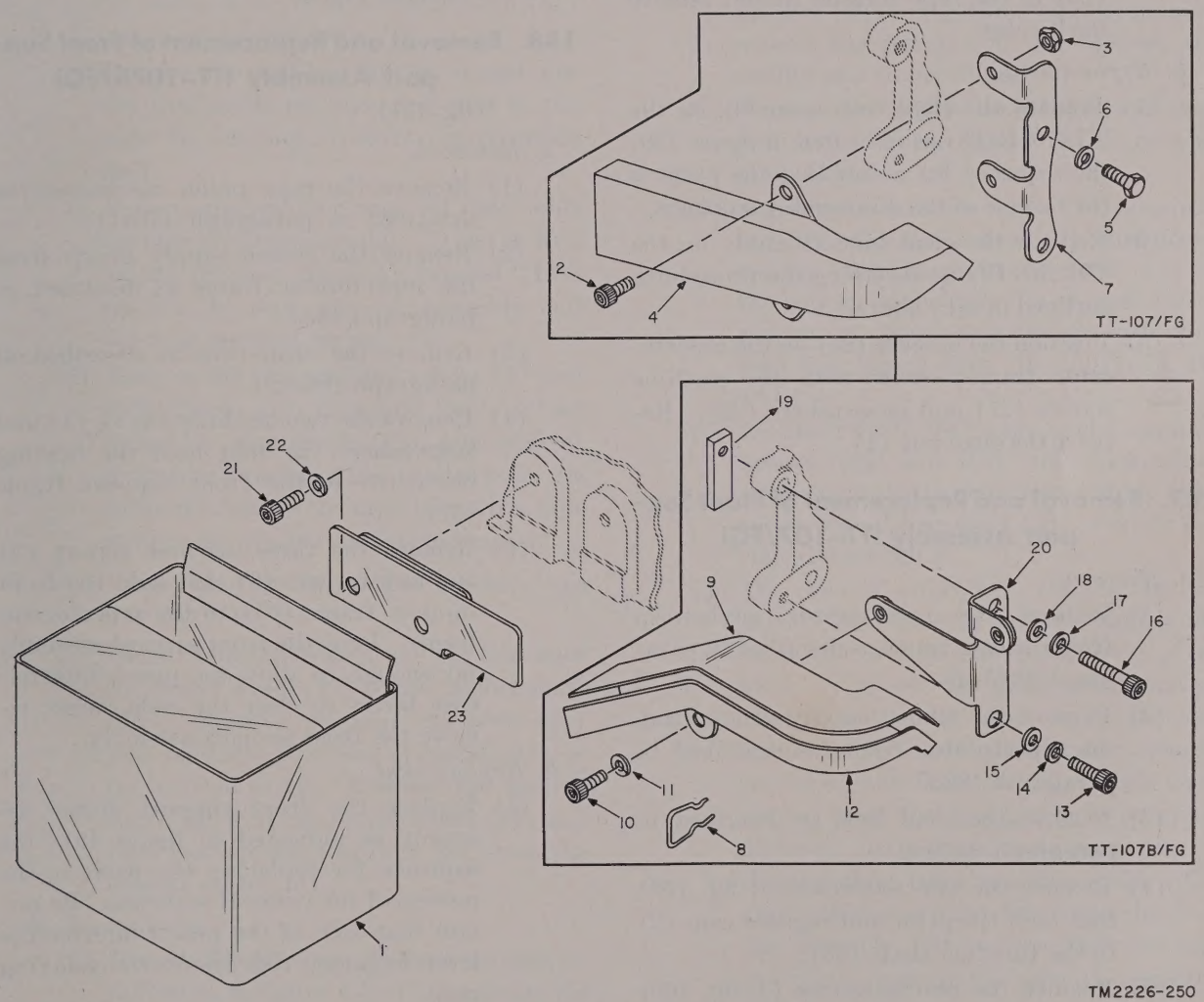
(fig. 150)

a. Removal.

(1) Remove the chad box (1) from the bracket (23).

(2) On the TT–107/FG, remove the two machine screws (2) and self-locking hexagonal nuts (3) that hold the chad tube (4) to the chad tube bracket (7); remove the chad tube. Remove the two machine screws (5) and lockwashers (6) that hold the chad tube bracket to the front support frame; remove the chad tube bracket.

(3) On the TT–107B/FG, remove the three cover clamps (8) that hold the chad tube cover (9) to the chad tube (12); remove



1 Chad box, 54196A (TT–107/FG) or 57611A (TT–107B/FG)
2 Machine screw, 10008
3 Self-locking hexagonal nut, 10501
4 Chad tube, 54160A
5 Machine screw, 10076
6 Lockwasher, 10430
7 Chad tube bracket, 54170
8 Cover clamp, 57668
9 Chad tube cover, 57688
10 Machine screw, 10032
11 Lockwasher, 10430
12 Chad tube, 57665A
13 Machine screw, 10009
14 Lockwasher, 10430
15 Flat washer, 10463
16 Machine screw, 10011
17 Lockwasher, 10430
18 Flat washer, 10463
19 Nut plate, 57669
20 Chad tube bracket, 57666A
21 Machine screw, 10008
22 Lockwasher, 10430
23 Bracket, 54176

Figure 150. Chad tube assembly, exploded view.

the chad tube cover. Remove the two machine screws (10) and lockwashers (11) that hold the chad tube (12) to the chad tube bracket (20); remove the chad tube. Remove the machine screw (13), lockwasher (14), flat washer (15), machine screw (16), lockwasher (17), flat washer (18), and nut plate (19) that hold the chad tube bracket to the front support frame; remove the chad tube bracket.

(4) Remove the two machine screws (21) and lockwashers (22) that hold the bracket (23) to the reperforator frame; remove the bracket.

b. Replacement.

(1) Replace the chad tube assembly on the TT–107B/FG as indicated in figure 150; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the chad tube assembly on the TT–107/FG by reversing the procedures outlined in *a*(2) above.

(3) Position the bracket (23) on the reperforator frame; secure with the machine screws (21) and lockwashers (22). Replace the chad box (1).

187. Removal and Replacement of Front Support Assembly (TT–107/FG)

a. Removal.

(1) Remove the reperforator mechanism from the base frame as described in paragraph 165*b*(4).

(2) Remove the ribbon supply group from the reperforator frame as described in paragraph 182*a*.

(3) Remove the chad tube as described in paragraph 186*a*(2).

(4) Remove the two setscrews (1, fig. 162) that hold the print and register cam (2) to the function shaft (33).

(5) Remove the two setscrews (3, fig. 160) that hold the type wheel driven gear (4) to the stop arm shaft (8).

(6) Remove the three machine screws (5, fig. 151) and lockwashers (6) that hold the front support frame (60) to the reperforator frame.

b. Replacement.

(1) Replace the front support assembly as indicated in figure 151; the sequence of replacement is the reverse of the removal sequence. Be sure that each of the punch interference levers engages a code ring in the code-ring cage.

(2) Replace the chad tube as described in paragraph 186*b*(2).

(3) Replace the ribbon supply group as described in paragraph 182*b*.

(4) Replace the reperforator mechanism on the base frame.

188. Removal and Replacement of Front Support Assembly (TT–107B/FG)

(fig. 151)

a. Removal.

(1) Remove the tape puller mechanism as described in paragraph 176*a*(1).

(2) Remove the ribbon supply group from the reperforator frame as described in paragraph 183*a*.

(3) Remove the chad tube as described in paragraph 186*a*(2).

(4) Remove the two machine screws (1) and lockwashers (2) that hold the bearing block (3) to the front support frame (61).

(5) Remove the three machine screws (5) and lockwashers (6) that hold the front support frame (61) to the reperforator frame. Drop the front support assembly far enough to allow the punch interference levers to clear the code rings; remove the front support assembly.

b. Replacement.

(1) Replace the front support frame assembly as indicated in figure 151; the sequence for replacing the parts is the reverse of the removal sequence. Be certain that each of the punch interference levers engages a code ring in the code ring cage.

(2) Replace the chad tube assembly as described in paragraph 186*b*(1).

(3) Replace the ribbon supply group as described in paragraph 183*b*.

(4) Replace the tape puller mechanism as described in paragraph 176*b*.

189. Disassembly and Reassembly of Tape Feed Mechanism

(fig. 152)

a. Disassembly.

(1) Remove the front support assembly from the reperforator as described in paragraphs 187*a* or 188*a*.

(2) Remove the detent lever spring (1) from the retainer mounting bracket (13) and from the detent lever (3).

(3) Remove the retainer ring (2) that holds the detent lever to the eccentric stud (5); remove the detent lever.

(4) Remove the self-locking hexagonal nut (4) that holds the eccentric stud to the code die support; remove the eccentric stud.

(5) Remove the retainer ring (6) that holds the tape retainer assembly (7) to the stud on the retainer mounting bracket (13); remove the tape retainer assembly and the tape retainer spring (8).

(6) Remove the two machine screws (9) and lockwashers (10) that hold the tape tear wire (11), tape guide (12), and retainer mounting bracket (13) to the code die support; remove the tape tear wire, tape guide, and retainer mounting bracket.

Note. The TT–107/FG does not have tape tear wire (11).

(7) Remove the two setscrews (14) that hold the detent wheel (17) to the ratchet shaft (16). Remove the two setscrews (15) that hold the tape feed sprocket (18) to the ratchet shaft. Remove the ratchet shaft, catching the detent wheel (17) and tape feed sprocket as they fall from the ratchet shaft (16).

b. Reassembly.

(1) Reassemble the tape feed mechanism as indicated in figure 152; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the tape feed mechanism as described in paragraphs 80, 83, and 84.

(3) Replace the front support assembly as described in paragraph 188*b* or 187*b*.

190. Disassembly and Reassembly of Punch and Die Support Assembly

(fig. 153)

a. Disassembly.

(1) Remove the front support assembly from the reperforator as described in paragraph 187*a* for the TT–107/FG or in paragraph 188*a* for the TT–107B/FG.

(2) Remove the tape feed mechanism as described in paragraph 189*a*.

(3) Remove the two machine screws (1) and lockwashers (2) that hold the code die support (30) to the front support frame; remove the punch and die support assembly and shims (3 and 4).

(4) Remove the self-locking hexagonal nut (5) and machine screw (6) from the comb (11).

(5) Remove the machine screw (7), terminal lug (8), machine screw (9), and lockwasher (10) that hold the comb (11) to the bottom of the code die support (30); remove the comb and the six code and feed hole punch bars (12, 13, 14, 15, 16, and 17).

(6) On the TT–107/FG, remove the machine screws (18 and 19) and lockwasher (20) that hold the code die assembly (21) to the code die support (30); remove the code die assembly.

(7) On the TT–107B/FG, remove the retainer ring (22) that holds the tape guide lever (23) to the tape guide lever pivot (25). Unhook the guide lever spring (24) from the tape guide lever (23) and from the indicator plate (26); remove the tape guide lever and tape guide lever spring from the tape guide lever pivot. Remove the tape guide lever pivot, indicator plate (26), machine screw (27), and lockwasher (28) that hold the code die assembly (29) to the code die support (30); remove the code die assembly (29).

b. Reassembly.

(1) Reassemble the punch and die support assembly as indicated in figure 153; the sequence for assembling the parts is the reverse of the disassembly sequence.

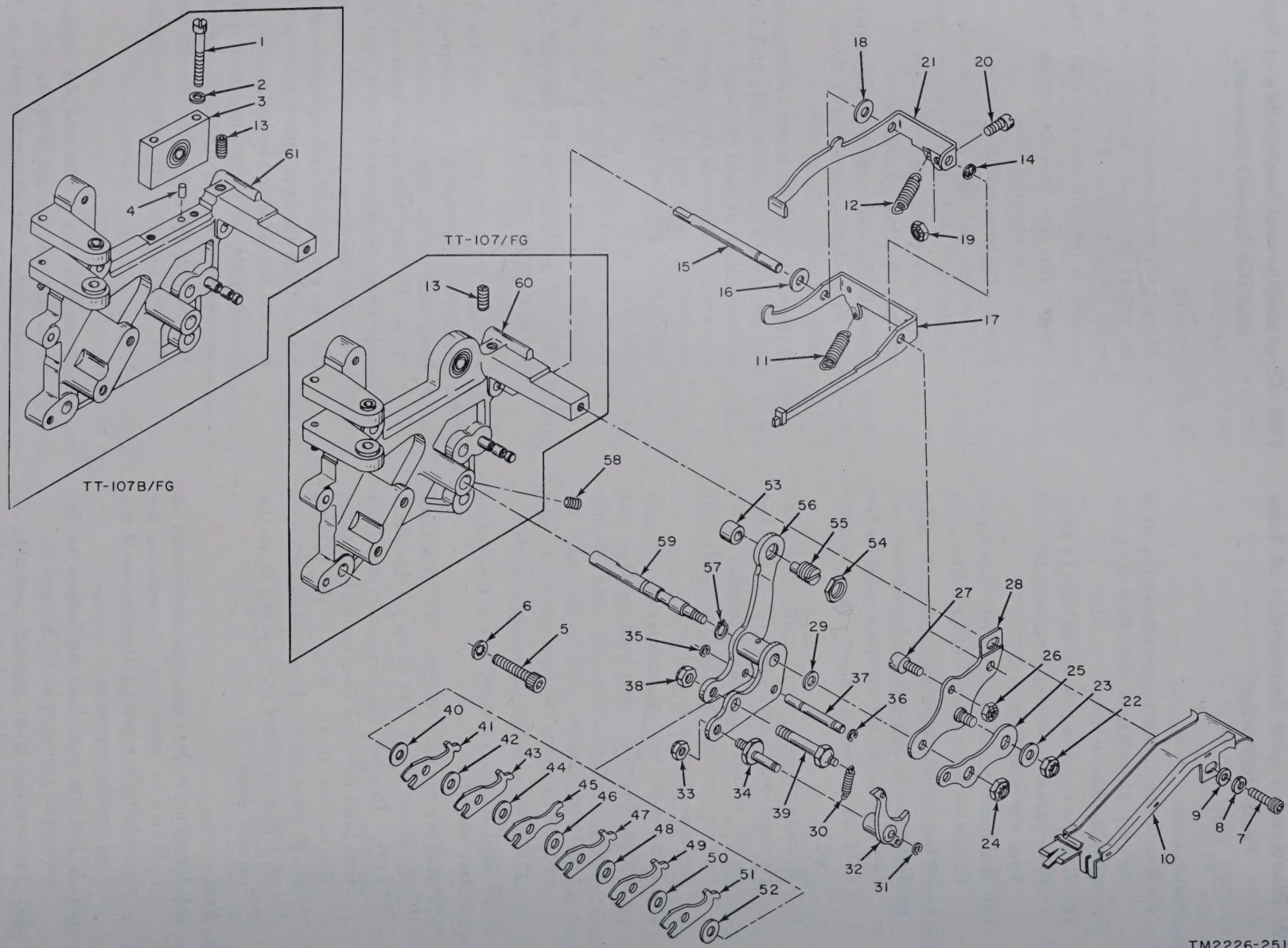
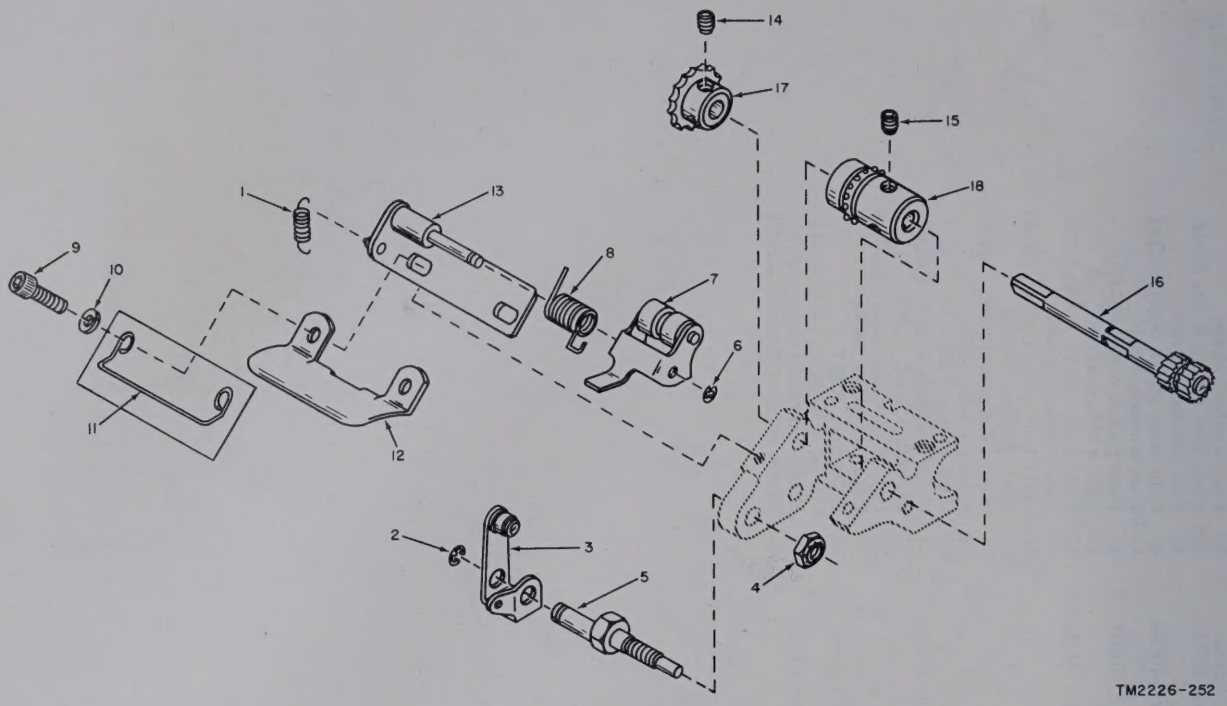


Figure 151. Front support assembly, exploded view.

1 Machine screw, 10063
2 Lockwasher, 10430
3 Bearing block, 55131
4 Dowel
5 Machine screw, 10035–01
6 Lockwasher, 10405
7 Machine screw, 10009
8 Lockwasher, 10430
9 Flat washer, 50315
10 Tape chute, 52489A
11 Print hammer lever spring, 52163
12 Register lever spring, 52163
13 Setscrew, 10211
14 Retainer ring, 10949
15 Print and register levers shaft, 52486
16 Flat washer, 52651
17 Print hammer lever, 52436A
18 Flat washer, 52651
19 Self-locking hexagonal nut, 10501
20 Print hammer eccentric stop, 52485
21 Type wheel register lever, 52432
22 Self-locking hexabonal nut, 10525
23 Flat washer, 10464
24 Self-locking hexagonal nut, 10525
25 Adjusting plate, 52493
26 Self-locking hexagonal nut, 10501 (TT–107/FG)
27 Print hammer eccentric stop, 52485 (TT–107/FG)
28 Support plate, 52321A
29 Flat washer, 52651
30 Feed pawl spring, 52164
31 Retainer ring, 10960
32 Feed pawl assembly, 52331A
33 Self-locking hexagonal nut, 10501
34 Feed pawl pivot, 52329
35 Retainer ring, 10960
36 Retainer ring, 10960
37 Code and feed hole punch lever stop pin, 52327
38 Self-locking hexagonal nut, 10525
39 Pivot stud, 52409
40 Flat washer, 52446
41 Code hole punch lever, 52346
42 Flat washer, 52446
43 Code hole punch lever, 52346
44 Flat washer, 52446
45 Feed punch lever, 52347
46 Flat washer, 52446
47 Code hole punch lever, 52346
48 Flat washer, 52446
49 Code hole punch lever, 52346
50 Flat washer, 52446
51 Code hole punch lever, 52346
52 Flat washer, 52446
53 Cam roller, 52354
54 Plain hexagonal nut, 10526
55 Eccentric stud, 52365
56 Punch arm assembly, 52337A
57 Retainer ring, 10971
58 Setscrew, 10211
59 Punch arm pivot post, 52345
60 Front support frame, 52438A
61 Front support frame, 55127A

Figure 151—Continued



1 Detent lever spring, 52166
2 Retainer ring, 10949
3 Detent lever, 52445A
4 Self-locking hexagonal nut, 10501
5 Eccentric stud, 52342
6 Retainer ring, 10969
7 Tape retainer assembly, 52126A
8 Tape retainer spring, 52422
9. Machine screw, 10003 (TT–107/FG) or 10004 (TT–107B/FG)
10 Lockwasher, 10429
11 Tape tear wire, 56164
12 Tape guide, 52519
13 Retainer mounting bracket, 52598A (TT–107/FG) or 56298A (TT–107B/FG)
14 Setscrew, 10201
15 Setscrew, 10201
16 Ratchet shaft, 52442A
17 Detent wheel, 52384
18 Tape feed sprocket, 52377

Figure 152. Tape feed mechanism, exploded view.

(2) Adjust the punch and die support assembly as described in paragraphs 77 through 84.

(3) Replace the tape feed mechanism as described in paragraph 189*b*.

(4) Replace the front support assembly as described in paragraph 188*b* for the TT–107B/FG or in paragraph 187*b* for the TT–107/FG.

191. Disassembly and Reassembly of Type Wheel Group

(fig. 154)

a. Disassembly.

(1) Remove the cotter pin (1) that holds the ribbon guide (3) to the stud on the type wheel lower bell crank lever (13); remove the flat washer (2), ribbon guide, and flat washer (4).

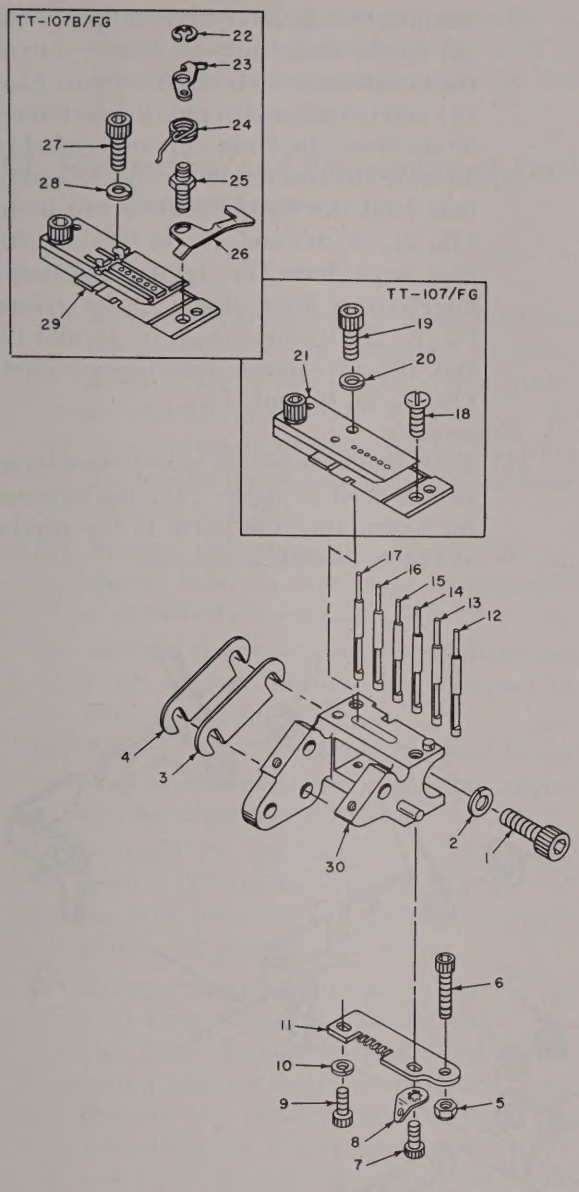
(2) Remove the machine screw (5), nut plate (6), and flat washer (7) that hold the type wheel upper bell crank lever (8) to the reciprocating lever shaft (16); remove the type wheel upper bell crank lever.

(3) Remove the type wheel bell crank lever spring (12) from the type wheel lower bell crank lever (13) and from the spring post on the front support frame.

(4) Remove the machine screw (9), nut plate (10), and flat washer (11) that hold the type wheel lower bell crank lever (13) to the reciprocating lever shaft (16); remove the type wheel lower bell crank lever.

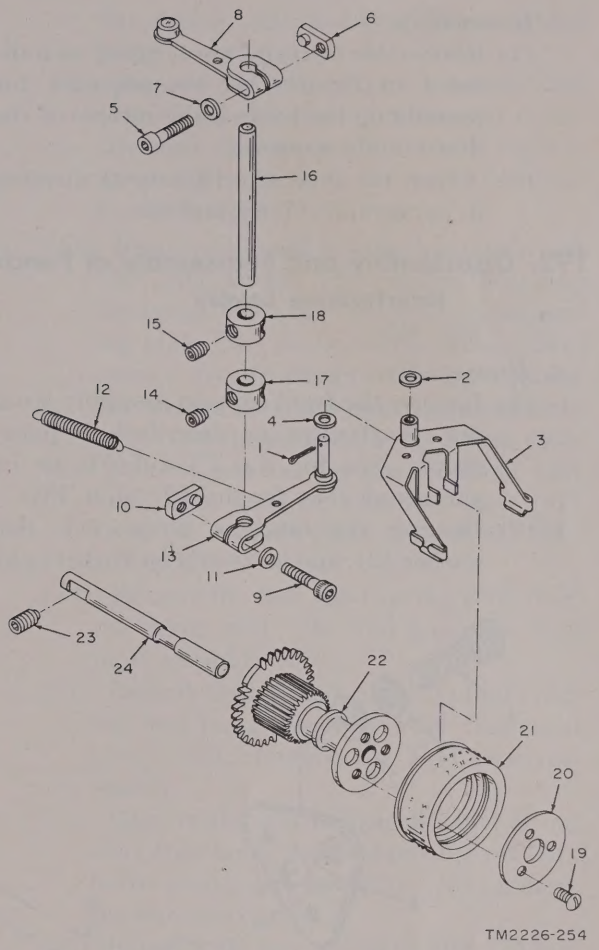
(5) Remove the two setscrews (14) that hold the shaft collar (17) to the reciprocating lever shaft. Remove the two setscrews (15) that hold the shaft collar (18) to the reciprocating lever shaft; remove the reciprocating lever shaft, catching the shaft collars as they fall from the shaft.

(6) Remove the assembled type wheel hub assembly (22) and type wheel (21) from



1	Machine screw, 10017–01	17	Code punch bar, 52369
2	Lockwasher, 10431	18	Machine screw, 10358
3	.005-inche shim, 52578	19	Machine screw, 10009
4	.002-inch shim, 52577	20	Lockwasher, 10430
5	Self-locking hexagonal nut, 10500	21	Code die asembly, 52521A
6	Machine screw, 10006	22	Retainer ring, 10969
7	Machine screw, 10003	23	Tape guide lever, 56163
8	Terminal lug, 20795	24	Tape guide lever spring, 56396
9	Machine screw, 10003	25	Tape guide lever pivot, 56161
10	Lockwasher, 10429	26	Indicator plate, 56397
11	Comb, 52355	27	Machine screw, 10009
12	Code punch bar, 52369	28	Lockwasher, 10430
13	Code punch bar, 52369	29	Code die assembly, 56256A
14	Code punch bar, 52369	30	Code die support, 52372
15	Feed hole punch bar, 52389		
16	Code punch bar, 52369		

Figure 153. Punch and die support assembly, exploded view.



1	Cotter pin, 10806	15	Setscrew, 10201
2	Flat washer, 50320	16	Reciprocating lever shaft, 52414
3	Ribbon guide, 52416A	17	Shaft collar, 50391
4	Flat washer, 50320	18	Shaft collar, 50391
5	Machine screw, 10006	19	Machine screw, 10305
6	Nut plate, 50174	20	Type wheel clamp plate mounting disk, 52407
7	Flat washer, 10459	21	Type wheel, 52461 (TT–107/FG) or 55132 (TT–107B/FG)
8	Type wheel upper bell crank lever, 52482A	22	Type wheel hub assembly, 52380 (TT–107/FG) or 55134A (TT–107B/FG)
9	Machine screw, 10006	23	Setscrew, 10211
10	Nut plate, 50174	24	Type wheel post, 52418
11	Flat washer, 10459		
12	Type wheel bell crank lever spring, 52161		
13	Type wheel lower bell crank lever, 52480A		
14	Setscrew, 10201		

Figure 154. Type wheel group, exploded view.

the type wheel post (24). Remove the three machine screws (19) that hold the type wheel clamp plate mounting disk (20) to the type wheel hub assembly; remove the type wheel clamp plate mounting disk and type wheel.

(7) Remove the setscrew (23) that holds the type wheel post (24) to the front support frame; remove the type wheel post.

b. Reassembly.

(1) Reassemble the type wheel group as indicated in figure 154; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the type wheel group as directed in paragraphs 87, 88, and 89.

192. Disassembly and Reassembly of Punch Interference Levers

(fig. 155)

a. Disassembly.

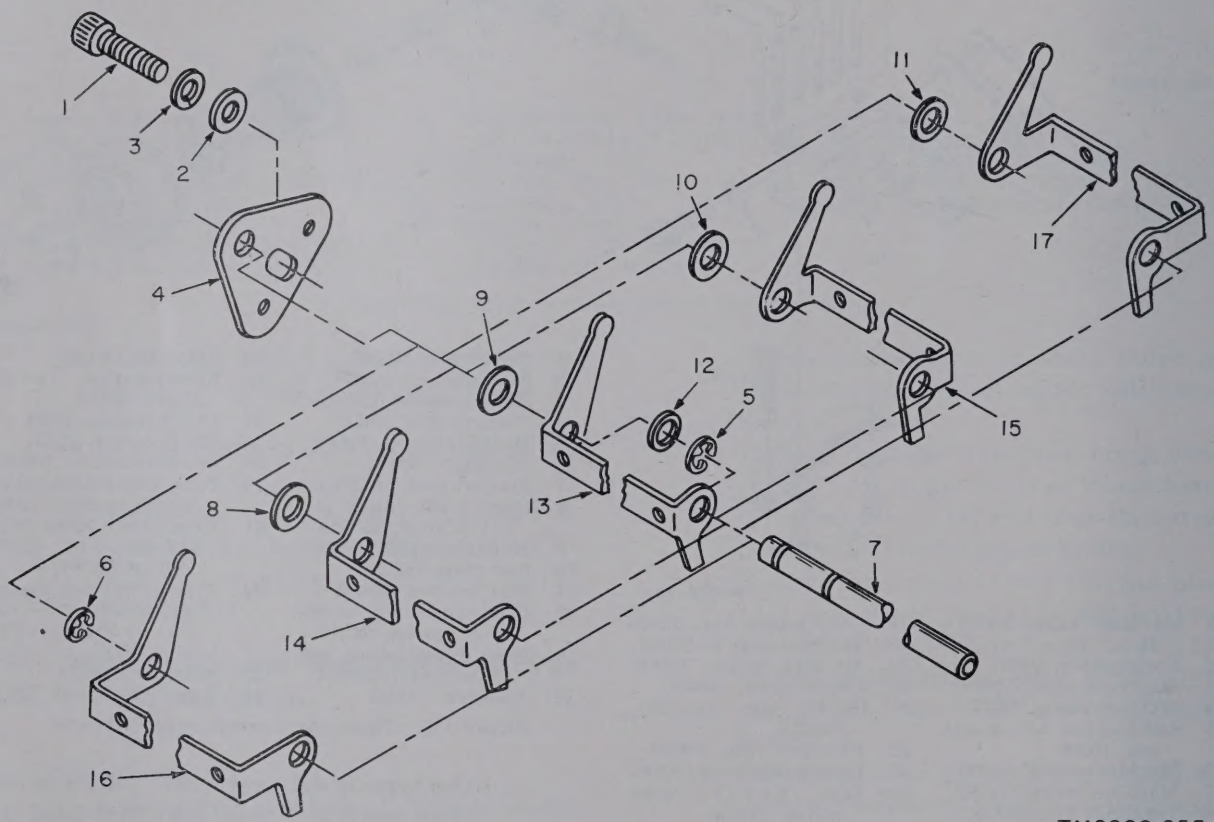
(1) Remove the front support assembly from the reperforator as described in paragraph 187*a* for the TT–107/FG or in paragraph 188*a* for the TT–107B/FG.

(2) Remove the machine screw (1), flat washer (2), and lockwasher (3) that hold the interference lever shaft support plate (4) to the front support frame; remove the interference lever shaft support plate (4) and the assembled punch interference levers from the front support assembly.

(3) Remove the two retainer rings (5 and 6) that hold the punch interference levers (13, 14, 15, 16, and 17) to the interference lever shaft (7); remove the punch interference lever shaft (7) to release the five flat washers (8, 9, 10, 11, and 12) and the five punch interference levers (13, 14, 15, 16, and 17).

b. Reassembly.

(1) Reassemble the punch interference levers as indicated in figure 155; the sequence for assembling the parts is the reverse of the disassembly sequence.



1 Machine screw, 10009
2 Flat washer, 10463
3 Lockwasher, 10430
4 Interference lever shaft support plate
5 Retainer ring, 10949
6 Retainer ring, 10949
7 Interference lever shaft, 52452
8 Flat washer, 52430
9 Flat washer, 52430
10 Flat washer, 52430
11 Flat washer, 52430
12 Flat washer, 50831
13 Punch interference lever, No. 1, 52424
14 Punch interference lever No. 3, 52427
15 Punch interference lever, No. 2, 52426
16 Punch interference lever, No. 5, 52429
17 Punch interference lever, No. 4, 52428

Figure 155. Punch interference levers, exploded view.

(2) Replace the front support assembly as described in paragraph 187*b* for the TT–107/FG or in paragraph 188*a* for the TT/107B/FG.

193. Disassembly and Reassembly of Front Support Frame

(fig. 151)

a. Disassembly.

(1) Remove the front support assembly from the reperforator as described in paragraph 187*a* for TT–107/FG or in paragraph 188*a* for TT–107B/FG.

(2) Remove the tape feed mechanism from the front support assembly as described in paragraph 189*a*.

(3) Remove the punch and die support assembly from the front support assembly as described in paragraph 190*a*.

(4) Remove the type wheel group from the front support assembly as described in paragraph 191*a*.

(5) Remove the punch interference levers from the front support assembly as described in paragraph 192*a*.

(6) Remove the machine screw (7), lockwasher (8), and flat washer (9) that hold the tape chute (10) to the front support frame. Remove the tape chute.

(7) Remove the print hammer lever spring (11) from the print hammer lever (17) and from the register and print levers spring post on the front support frame. Remove the register lever spring (12) from the type wheel register lever (21) and from the spring post on the front support frame.

(8) Remove the setscrew (13) that holds the print and register levers shaft (15) in the front support frame. Remove the assembled print hammer lever (17), type wheel register lever (21), and print and register levers shaft (15) from the front support frame.

(9) Remove the retainer ring (14) that holds the print hammer lever (17) and type wheel register lever (21), to the print and register levers shaft (15); remove the print and register levers shaft, releasing the flat washer (16), print hammer lever, flat washer (18), and type wheel register lever.

(10) Remove the self-locking hexagonal nut (19) that holds the print hammer eccentric stop (20) to the type wheel register lever (21); remove the print hammer eccentric stop.

(11) Remove the self-locking hexagonal nut (22), flat washer (23), and self-locking hexagonal nut (24) that hold the adjusting plate (25) to the support plate (28); remove the adjusting plate, support plate, flat washer (29), and punch arm assembly (56) from the punch arm pivot post (50).

(12) Remove self-locking hexagonal nut (26) and print hammer eccentric stop (27) from the support plate (28) on the TT–107/FG.

(13) Remove the feed pawl spring (30) from the pivot stud (39) and from the feed pawl assembly (32).

(14) Remove the retainer ring (31) that holds the feed pawl assembly to the feed pawl pivot (34); remove the feed pawl assembly.

(15) Remove the self-locking hexagonal nut (33) that holds the feed pawl pivot (34) to the punch arm assembly (56); remove the feed pawl pivot.

(16) Remove the two retainer rings (35 and 36) that hold the code and feed hole punch lever stop pin (37) to the punch arm assembly (56); remove the code feed hole punch lever stop pin.

(17) Remove the self-locking hexagonal nut (38) that holds the pivot stud (39) to the punch arm assembly (56): remove the pivot stud, catching the seven flat washers (40, 42, 44, 46, 48, 50, and 52); code hole punch levers (41, 43, 47, 49, and 51) and the feed punch lever (45) as they fall from the pivot stud (39).

(18) Remove the cam roller (53) from the eccentric stud (55) on the punch arm assembly (56). Remove the plain hexagonal nut (54) and eccentric stud from the punch arm assembly.

(19) Remove the retainer ring (57) from the punch arm pivot post (59). Remove the setscrew (58) that holds the punch arm pivot post to the front support; remove the punch arm pivot post (59).

(20) Remove any loose or damaged spring post or dowel from the front support frame.

b. Reassembly.

(1) Reassemble the front support frame assembly by reversing the disassembly sequence outlined in paragraph a (2) through (20) above.

(2) Adjust the front support frame assembly as described in paragraphs 75 through 99.

(3) Replace the front support assembly as described in paragraph 187*b* for TT–107/FG or paragraph 188*b* for TT–107B/FG.

194. Disassembly and Reassembly of Y-Levers and Selector Levers (TT–107/FG)

a. Disassembly.

(1) Remove the two setscrews (1, fig. 156) that hold the Y-lever retaining collar (2) to the Y-lever pivot post stud (19); remove the Y-lever retaining collar (2), friction plate spring (3), six friction plates (4, 6, 8, 10, 12, and 14), five Y-levers (5, 7, 9, 11, and 13), and the Y-lever pivot post collar (15).

(2) Remove the setscrew (16) that holds the Y-lever stop (17) in the reperforator frame; remove the Y-lever stop.

(3) Remove the setscrew (18) that holds the Y-lever pivot post stud (19) to the reperforator frame; remove the Y-lever pivot post stud.

(4) Remove the friction plate guide stud (20) from the reperforator frame.

(5) Remove the six selector lever springs (21) from the selector levers (29, 32, 35, 38, and 41), and selector camshaft locking lever (26) and from the selector lever spring post (23).

(6) Unhook the transfer lever trip latch spring (36, fig. 161) from the selector lever spring post (23, fig. 156). Loosen the plain hexagonal nut (22) that locks the selector lever spring post in the reperforator frame; remove the selector lever spring post and plain hexagonal nut. Remove the plain hexagonal nut from the spring post.

(7) Remove the self-locking hexagonal nut (24), the selector camshaft locking lever eccentric (25), and the selector camshaft locking lever (26) from the selector lever pivot stud (44).

(8) Remove the flat washers (27, 30, 33, 36, and 39), bearings (28, 31, 34, 37, and 40), selector levers (29, 32, 35, 38, and 41), and selector lever pivot post collar (42) from the selector lever pivot stud (44).

(9) Remove the setscrew (43) that holds the selector lever pivot stud in the reperforator frame; remove the selector lever pivot stud.

b. Reassembly.

Note. If any of the Y-levers, selector levers, or bearings are damaged and must be replaced, replace a complete set. These items are machined as matched sets. The unit will not function properly when operating with unmatched sets.

(1) Reassemble the Y-levers and selector levers as indicated in figure 156; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the selector and Y-levers as described in paragraphs 70, 74, and 108.

195. Disassembly and Reassembly of Y-Levers and Selector Levers (TT–107B/FG)

a. Disassembly.

(1) Remove the five Y-lever detent spring (1, 2, 3, 4, and 5, fig. 157) from the Y-lever detent spring bracket (21) and from the Y-lever detents (8, 11, 13, 15, and 17).

(2) Remove the plain hexagonal nut (6) and lockwasher (7) that hold the Y-lever detent eccentric sleeve (19) to the Y-lever detent pivot post (20); slide the assembled eccentric sleeve and Y-lever detents from the Y-lever detent pivot post.

(3) Remove the Y-lever detents (8, 11, 13, 15, and 17), spacer (9), and detent spacers (10, 12, 14, 16, and 18) alternately from the Y-lever detent eccentric sleeve (19).

(4) Remove the Y-lever detent pivot post (20) from the reperforator frame; remove the Y-lever detent spring bracket (21).

(5) Remove the two setscrews (22 and 23) from the Y-lever retaining collar (24); remove the Y-lever retaining collar. Remove the flat washers (25, 27, 29, 31, and 33), selector Y-levers (26, 28, 30, 32, and 34), and the Y-lever pivot post collar (35) from the Y-lever pivot post stud (37).

(6) Remove the setscrew (36) that holds the Y-lever pivot post stud (37) in the reperforator frame; remove the Y-lever pivot post stud.

(7) Remove the setscrew (38) that holds the Y-lever eccentric stop (39) in the reperforator frame; remove the Y-lever eccentric stop.

(8) Remove the six selector lever springs (40, 41, 42, 43, 44, and 45) from the selector lever spring post (68) and from the selector camshaft locking lever (48) and the five selector levers (50, 53, 56, 59, and 62). Unhook the transfer lever trip latch spring (36, fig. 161) from the selector lever spring post (68, fig. 157).

(9) Remove the self-locking hexagonal nut (46), the selector camshaft locking lever eccentric (47), and the selector camshaft locking lever (48) from the selector lever pivot stud (66).

(10) Remove the flat washers (49, 52, 55, 58, and 61), selector levers (50, 53, 56, 59, and 62), and the bearings (51, 54, 57, 60, and 63) alternately. Remove the selector lever pivot stud collar (64) from the selector lever pivot stud (66).

(11) Remove the setscrew (65) that holds the selector lever pivot stud (66) in the reperforator frame; remove the selector lever pivot stud.

(12) Loosen the plain hexagonal nut (67) that locks the selector lever spring post (68) in the frame. Remove the selector lever spring post from the frame of the reperforator; remove the plain hexagonal nut (67) from the selector lever spring post.

b. Reassembly.

Note. If any of the Y-levers, selector levers, or bearings are damaged and must be replaced, replace a complete set. These items are machined as matched sets. The unit will not function properly when operating with unmatched sets.

(1) Reassemble the Y-levers and selector levers as indicated in figure 157; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the selector levers and Y-levers as described in paragraphs 71, 72, 73, 74, and 109.

196. Disassembly and Reassembly of Type Wheel Reciprocating Mechanism

(fig. 158)

a. Disassembly.

(1) Remove the code-ring locking bail cam follower spring (1), from the code-ring locking bail cam follower (5) and from the function plate (45).

(2) Remove the machine screw (2), nut plate (3), and flat washer (4) that hold the code-ring locking bail cam follower (5) to the code-ring locking bail shaft (11); remove the code-ring locking bail cam follower.

(3) Remove the machine screw (6), flat washer (7), and lockwasher (8) that hold the code-ring locking bail (9) to the code-ring locking bail shaft (11); remove the code-ring locking bail.

(4) Remove the four retainer rings (10) that hold the code-ring locking bail shaft to the function plate (45) and to the letters-figures shift latch lever (12). Disconnect the spring (32) from the letters-figures shift latch lever. Remove the code-ring locking bail shaft (11) and the letters-figures shift latch lever.

(5) Remove the retainer ring (13) that holds the type wheel reciprocating transfer lever (14) to the eccentric stud (17); remove the type wheel reciprocating transfer lever.

(6) Remove the self-locking hexagonal nut (15) and flat washer (16) that hold the eccentric stud (17) to the function plate (45); remove the eccentric stud.

(7) Remove the type wheel reciprocating lever spring (18) from the spring pin (28) and from the type wheel reciprocating spring lever (25).

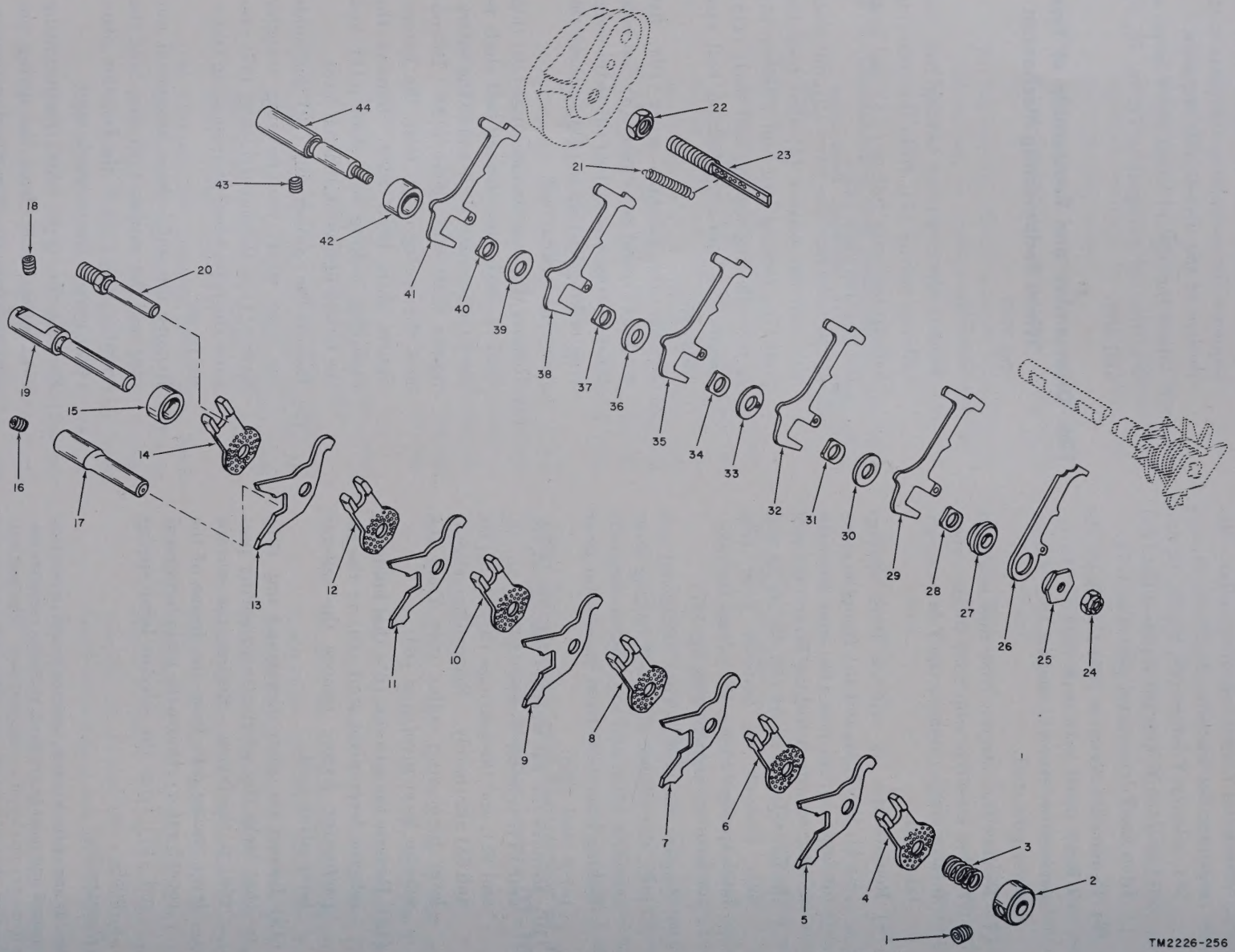
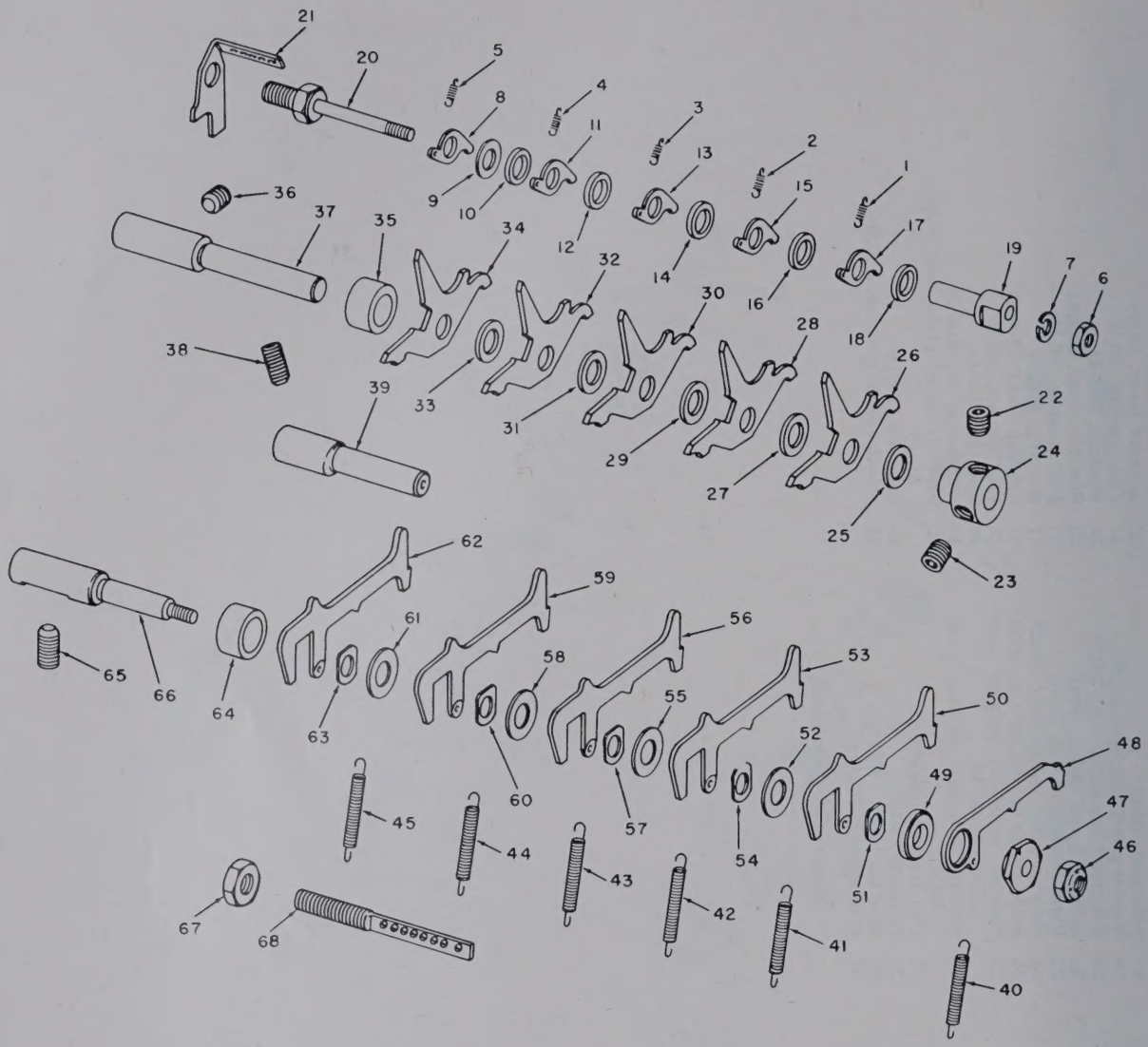


Figure 156. Y-levers and selector levers, exploded view (TT–107/FG).

1 Setscrew, 10209
2 Y-lever retaining collar, 50149
3 Friction plate spring, 50910
4 Friction plate, 50018
5 Y-lever, 50015
6 Friction plate, 50018
7 Y-lever, 50015
8 Friction plate, 50018
9 Y-lever, 50015
10 Friction plate, 50018
11 Y-lever, 50015
12 Friction plate, 50018
13 Y-lever, 50015
14 Friction plate, 50018
15 Y-lever pivot post collar, 51414
16 Setscrew, 10210
17 Y-lever stop, 50152
18 Setscrew, 10211
19 Y-lever pivot post, stud, 53269
20 Friction plate guide stud, 50151
21 Selector lever spring, 50902
22 Plain hexagonal nut, 10509
23 Selector lever spring post, 50325
24 Self-locking hexagonal nut, 10500
25 Selector camshaft locking lever eccentric, 50146
26 Selector camshaft locking lever, 50014
27 Flat washer, 50053
28 Bearing, 51604A
29 Selector lever, 51068A
30 Flat washer, 50147
31 Bearing, 51604A
32 Selector lever, 51068A
33 Flat washer, 50147
34 Bearing, 51604A
35 Selector lever, 51068A
36 Flat washer, 50147
37 Bearing, 51604A
38 Selector lever, 51068A
39 Flat washer, 50147
40 Bearing, 51604A
41 Selector lever, 51068A
42 Selector lever pivot post collar, 51416
43 Setscrew, 10211
44 Selector lever pivot stud, 53268

Figure 156—Continued



1 Y-lever detent spring, 55009
2 Y-lever detent spring, 55009
3 Y-lever detent spring, 55009
4 Y-lever detent spring, 55009
5 Y-lever detent spring, 55009
6 Plain hexagonal nut, 10504
7 Lockwasher, 10434
8 Y-lever detent, 55004
9 Spacer, 55076
10 Detent spacer, 55001
11 Y-lever detent, 55004
12 Detent spacer, 55001
13 Y-lever detent, 55004
14 Detent spacer, 55001,
15 Y-lever detent, 55004
16 Detent spacer, 55001
17 Y-lever detent, 55004
18 Detent spacer, 55001
19 Y-lever detent eccentric sleeve, 55007
20 Y-lever detent pivot post, 55008
21 Y-lever detent spring, bracket, 55002
22 Setscrew, 10209
23 Setscrew, 10209
24 Y-lever retaining collar, 55006
25 Flat washer, 50148
26 Y-lever, 55003
27 Flat washer, 50148
28 Y-lever, 55003
29 Flat washer, 50148
30 Y-lever, 55003
31 Flat washer, 50148
32 Y-lever, 55003
33 Flat washer, 50148
34 Y-lever, 55003
35 Y-lever pivot post collar, 51416
36 Setscrew, 10210
37 Y-lever pivot post stud, 53269
38 Setscrew, 10211
39 Y-lever eccentric stop, 50152
40 Selector lever spring, 50902
41 Selector lever spring, 50902
42 Selector lever spring, 50902
43 Selector lever spring, 50902
44 Selector lever spring, 50902

Figure 157. Y-levers and selector levers, exploded view (TT–107B/FG).

(8) Remove the two setscrews (19) that hold the shaft collar (20) to the type wheel shift lever stud (36); remove the shaft collar and the retainer plate (21).

(9) Remove the drive pins (22) and spring pin (28) from the type wheel reciprocating drive levers (23 and 29). Remove the type wheel reciprocating drive lever (23), flat washer (24), type wheel reciprocating spring lever (25), sleeve bearing (26), flat washer (27), type wheel reciprocating drive lever (29), and two flat washers (30 and 31).

(10) Remove the spring (32) from the figures-letters shift lever (33); remove the figures-letters shift lever and flat washer (34) from the type wheel shift lever stud (36).

(11) Remove the self-locking hexagonal nut (35) that holds the type wheel shift lever stud (36) to the function plate (45); remove the type wheel shift lever stud.

(12) Remove the bell sensing lever spring (37), shift cam follower spring (38), letters sensing levers spring (39), and figures sensing levers spring (40) from the function plate (45) and from the function sensing levers.

(13) Remove the two machine screws (41 and 43) and lockwashers (42 and 44) that hold the function plate (45) to the reperforator frame; remove the function plate.

b. Reassembly.

(1) Reassemble the type wheel reciprocating mechanism as indicated in figure 158; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the type wheel reciprocating mechanism as described in paragraphs 46, 50, 63, 64, and 98.

197. Disassembly and Reassembly of Function Sensing Mechanism

(fig. 159)

a. Disassembly.

(1) Remove the type wheel reciprocating mechanism as described in paragraph 196*a*.

(2) Remove the two setscrews (1) that hold the stop arm shaft driven gear (2) to the stop arm shaft; remove the stop arm shaft driven gear and thrust bearing (3).

(3) Remove the type wheel reciprocating cam follower (4), sensing lever spacer (5), and the assembled bell sensing lever (8) and signal bell clapper (7) from the cam lever assembly (18).

(4) Remove the setscrew (6) that holds the signal bell clapper (7) to the bell sensing lever (8); remove the signal bell clapper.

(5) Remove the sensing lever spacer (9), figures sensing lever (10), sensing lever spacer (11), letters sensing lever (12), and sensing lever spacer (13) from the cam lever assembly (18).

(6) Remove the plain hexagonal nut (14), lockwasher (15), and flat washer (16) that hold the restoring lever eccentric (17) to the stud on the cam lever assembly (18); remove the restoring lever eccentric.

(7) Remove the cam lever assembly (18) and laminated spacer (19) from the projection of the rear of the code-ring cage.

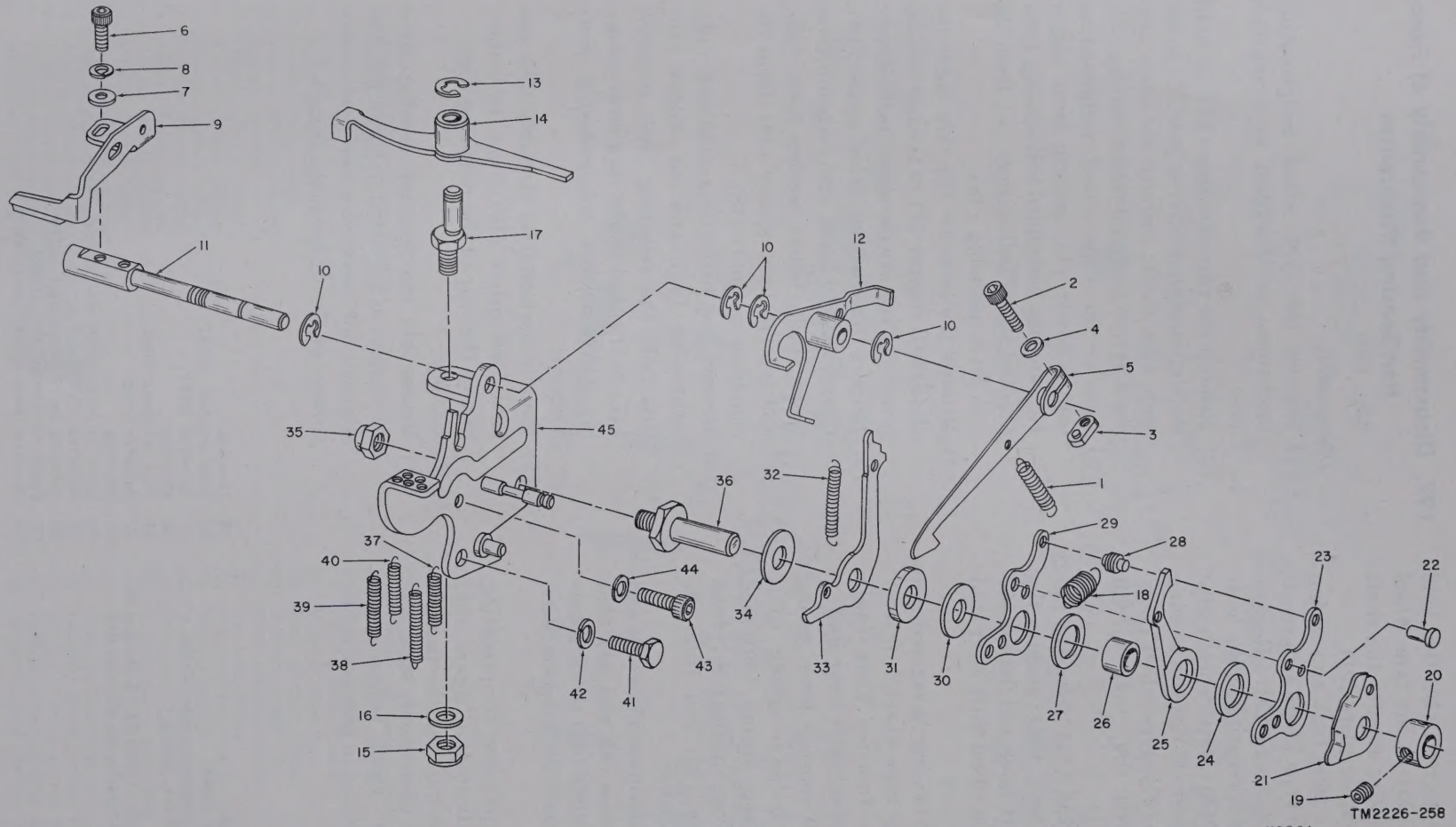
b. Reassembly.

(1) Reassemble the function sensing lever mechanism as indicated in figure 159; the sequence for assembling the parts is the reverse of the disassembly sequence.

---

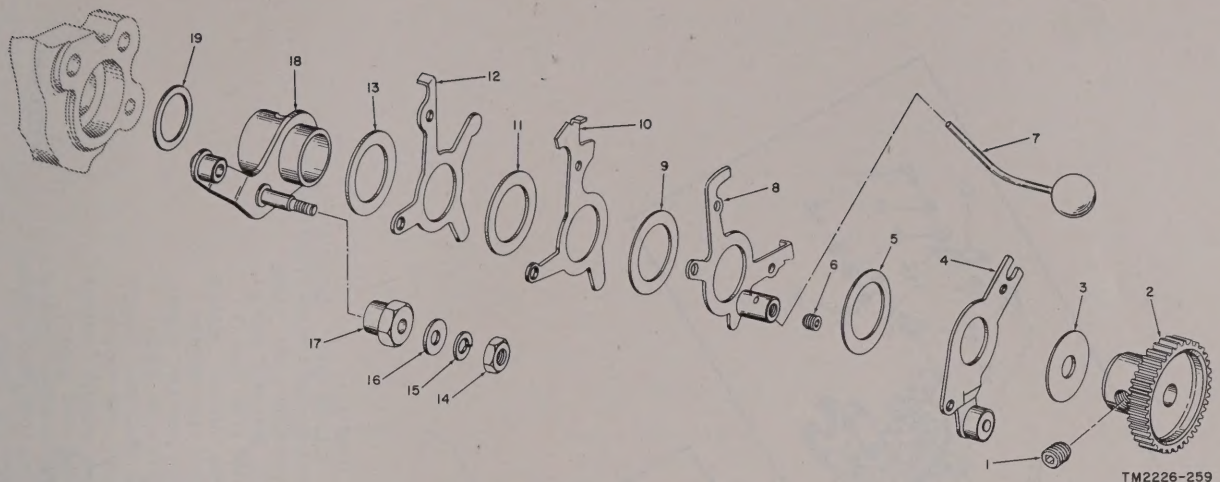
45 Selector lever spring, 50902
46 Self-locking hexagonal nut, 10500
47 Selector camshaft locking lever eccentric, 55024
48 Selector camshaft locking lever, 50014
49 Flat washer, 50053
50 Selector lever, 51068A, includes items 54, 57, 60, and 63
51 Bearing, 51604, (includes items 55, 58, 61, and 64)
52 Flat washer, 50147
53 Selector lever
54 Bearing
55 Flat washer, 50147
56 Selector lever
57 Bearing
58 Flat washer, 50147
59 Selector lever
60 Bearing
61 Flat washer, 50147
62 Selector lever
63 Bearing
64 Selector lever pivot stud collar, 51416
65 Setscrew, 10211
66 Selector lever pivot stud, 53268
67 Plain hexagonal nut, 10509
68 Selector lever spring post, 50325

Figure 157—Continued



1 Code-ring locking bail cam follower spring, 53569
2 Machine screw, 10006
3 Nut plate, 50174
4 Flat washer, 10459
5 Code-ring locking bail cam follower, 52657
6 Machine screw, 10004
7 Flat washer, 10458
8 Lockwasher, 10429
9 Code-ring locking bail, 52653
10 Retainer ring, 10949
11 Code-ring locking bail shaft, 52291
12 Letters-figures shift latch lever, 52411
13 Retainer ring, 10949
14 Type wheel reciprocating transfer lever, 52478
15 Self-locking hexagonal nut, 10525
16 Flat washer, 52430
17 Eccentric stud, 52399
18 Type wheel reciprocating lever spring, 52167
19 Setscrew, 10209
20 Shaft collar, 50209
21 Retainer plate, 53652
22 Drive pin, 52404
23 Type wheel reciprocating drive lever, 52362
24 Flat washer, 52402
25 Type wheel reciprocating spring lever, 52405
26 Sleeve bearing, 52401
27 Flat washer, 52402
28 Spring pin, 52403
29 Type wheel reciprocating drive lever, 52362
30 Flat washer, 53261
31 Flat washer, 52413
32 Spring, 52168
33 Figures-letters shift lever, 52406
34 Flat washer, 53261
35 Self-locking hexagonal nut, 10525
36 Type wheel shift lever stud, 52417
37 Bell sensing lever spring, 52173
38 Shift cam follower spring, 52172
39 Letters sensing levers spring, 52169
40 Figures sensing levers spring, 52171
41 Machine screw, 10076
42 Lockwasher, 10430
43 Machine screw, 10025
44 Lockwasher, 10430
45 Function plate, 52419A

Figure 158. Type wheel reciprocating mechanism, exploded view.



1 Setscrew, 10209
2 Stop arm shaft driven gear, 52344 (TT–107/FG), 56257 (TT–107B/FG)
3 Thrust bearing, 50374
4 Type wheel reciprocating cam follower, 52477A
5 Sensing lever spacer, 52649
6 Setscrew, 10203
7 Signal bell clapper, 52682
8 Bell sensing lever, 52368A
9 Sensing lever spacer, 52649
10 Figures sensing lever, 52483
11 Sensing lever spacer, 52649
12 Letters sensing lever, 52484
13 Sensing lever spacer, 52649
14 Plain hexagonal nut, 10512
15 Lockwasher, 10429
16 Flat washer, 50414
17 Restoring lever eccentric, 52664
18 Cam lever assembly, 52459A
19 Laminated spacer, 52679

Figure 159. Function sensing mechanism, exploded view.

(2) Replace the type wheel reciprocating mechanism as described in paragraph 196*b*.

(3) Adjust the function sensing mechanism as described in paragraphs 47, 58, 59, 60, and 61.

198. Removal and Replacement of Code-Ring Cage

(fig. 160)

a. Removal.

(1) On the TT–107B/FG, remove the tape puller mechanism as described in paragraph 176*a*.

(2) Remove the ribbon supply group from the reperforator as described in paragraph 182*a* for the TT–107/FG or paragraph 183*a* for the TT–107B/FG.

(3) Remove the front support assembly as described in paragraph 187*a* for the TT–107/FG or paragraph 188*a* for the TT–107B/FG.

(4) Remove the stop arm shaft driven gear as described in paragraph 197*a*(2).

(5) Remove the assembled type wheel driven gear (4), stop arm (7), and stop arm shaft (8).

(6) Remove the two machine screws (1) and lockwashers (2) that hold the code-ring cage to the reperforator frame; remove the code-ring cage.

b. Replacement.

(1) Position the code-ring cage on the reperforator frame, carefully engaging the tails of the T-levers in the slotted tails of the code rings; secure with two machine screws (1) and lockwashers (2).

(2) Replace the assembled type wheel driven gear (4), stop arm (7), and stop arm shaft (8).

(3) Replace the stop arm shaft driven gear as described in paragraph 197*b*.

(4) Replace the front support assembly as described in paragraph 188*b* for the TT–107B/FG or paragraph 187*b* for the TT–107/FG.

(5) Replace the ribbon supply group as described in paragraph 183*b* for the TT–107B/FG or paragraph 182*b* for the TT–107/FG. Make sure the mounting machine screws engage the bearing bracket (5).

(6) On the TT–107B/FG, replace the tape puller mechanism as described in paragraph 176*b*.

(7) Adjust the code-ring cage as described in paragraphs 46, 47, 48, 58, 59, 60, 61, 63, 64, 67, 85, 87, 88, and 90.

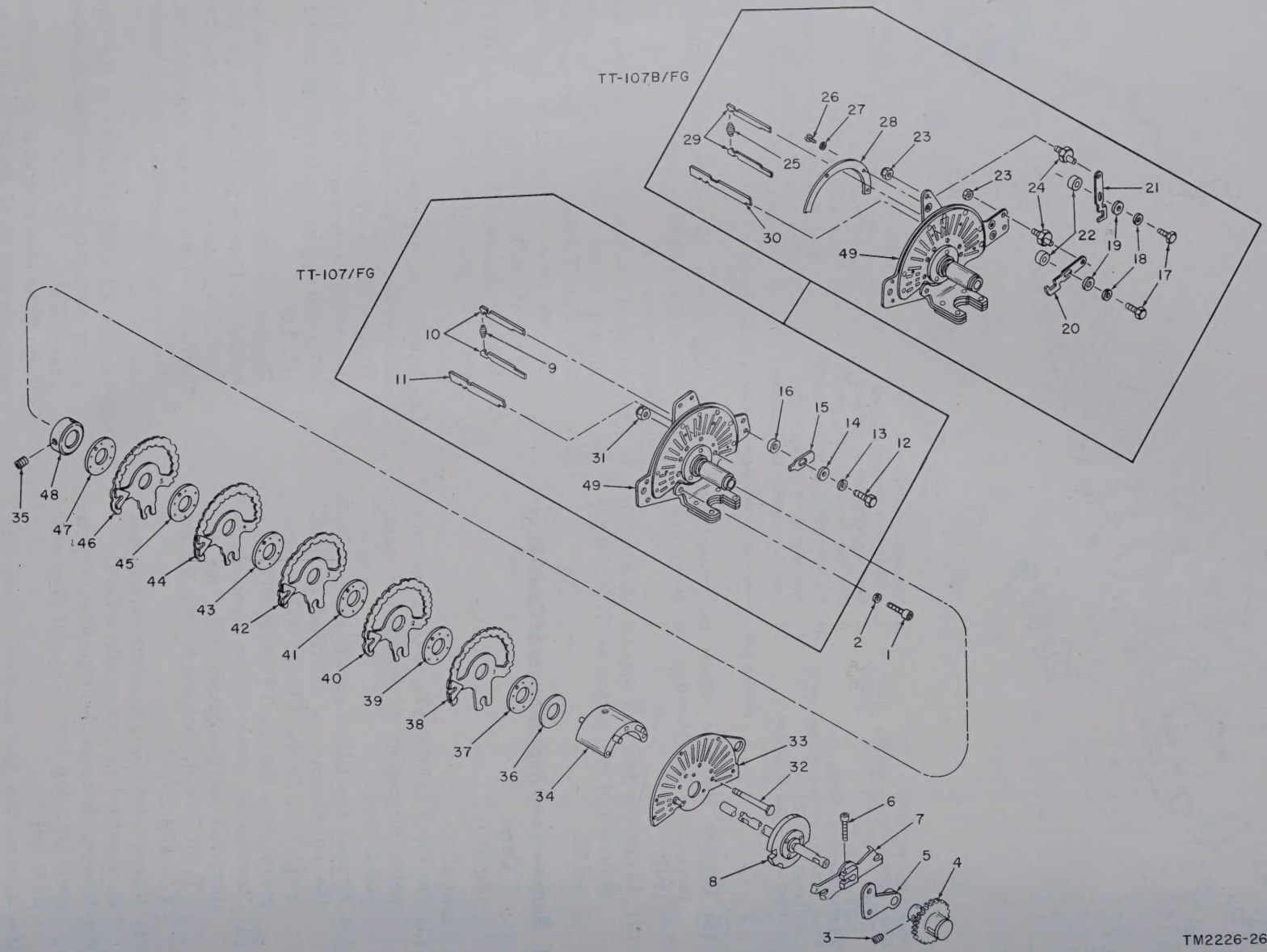


Figure 160. Code-ring cage, exploded view.

1 Machine screw, 10024
2 Lockwasher, 10429
3 Setscrew, 10209
4 Type wheel driven gear, 52431A
5 Bearing bracket, 53568A
6 Machine screw, 10009
7 Stop arm, 53802A
8 Stop arm shaft, 52134A
9 Stop bar lever spring, 52940
10 Stop bar, 50502
11 Function stop bar, 52333
12 Machine screw, 10398
13 Lockwasher, 10429
14 Flat washer, 10458
15 Adjustable fulcrum, 52177
16 Flat washer, 53602
17 Machine screw, 10087
18 Lockwasher, 10429
19 Flat washer, 10458
20 Adjustable fulcrum, 56178
21 Adjustable fulcrum, 56176
22 Flat washer, 53602
23 Self-locking hexagonal nut, 10500
24 Eccentric, 55738
25 Stop bar lever spring, 52940
26 Machine screw, 10317
27 Lockwasher, 10433
28 Retainer plate, 56177
29 Stop bar, 50502
30 Function stop bar, 57277
31 Self-locking hexagonal nut, 10500
32 Cage tie bolt, 53972
33 Code cage outside guide
34 Code cage spacer
35 Setscrew, 10209
36 Code-ring spacer, 53453
37 Ball retainer, 53647A
38 Code ring, 53641A
39 Ball retainer, 53647A
40 Code ring, 53642A
41 Ball retainer, 53647A
42 Code ring, 53643A
43 Ball retainer, 53647A
44 Code ring, 53644A
45 Ball retainer, 53647A
46 Code ring, 53645A
47 Ball retainer, 53647A
48 Code-ring collar, 51397
49 Code selecting guide plate, 53808A (TT–107/FG), 57272A (TT–107B/FG)

Figure 160—Continued

199. Disassembly and Reassembly of Code-Ring Cage

(fig. 160)

a. Disassembly.

(1) Remove the code-ring cage from the reperforator as described in paragraph 198*a*.

(2) Remove the two setscrews (3) that hold the type wheel driven gear (4) to the stop arm shaft (8); remove the type wheel driven gear and the bearing bracket (5).

(3) Remove the machine screw (6) that holds the stop arm (7) to the stop arm shaft (8); remove the stop arm.

(4) On the TT–107/FG, remove the stop bar lever springs (9) from the 29 stop bars (10) and from the three function stop bars (11). Remove the stop bars and the function stop bars from the code-ring cage. Remove the three machine screws (12), lockwashers (13), and flat washers (14) that hold the three adjustable fulcrums (15) to the code selecting guide plate (49); remove the three adjustable fulcrums and flat washers (16).

(5) On the TT–107B/FG, remove the three machine screws (17), lockwashers (18), and flat washers (19) that hold the two adjustable fulcrums (20) and the adjustable fulcrum (21) to the code selecting guide plate (49) and to the eccentrics (24); remove the adjustable fulcrums and the three flat washers (22). Remove the three self-locking hexagonal nuts (23) that hold the eccentrics (24) to the code selecting guide plate; remove the three eccentrics (24). Remove the stop bar lever springs (25) from the 29 stop bars (29) and from the three function stop bars (30). Remove the three machine screws (26) and lockwashers (27) that hold the retainer plate (28) to the code selecting guide plate (49); remove the retainer plate. Remove the stop bars and the three function stop bars from the code-ring cage.

(6) Remove the three self-locking hexagonal nuts (31) and cage tie bolts (32) that hold the code cage outside guide (33) to the code selecting guide plate (49); remove the assembled code cage outside guide and code cage spacer (34) from the shaft on the code selecting guide plate.

(7) Remove the two setscrews (35) that hold the code-ring collar (48) to the code selecting guide plate (49); remove the code-ring spacer (36), six ball retainers (37, 39, 41, 43, 45, and 47), five code-rings (38, 40, 42, 44, and 46), and the code-ring collar.

b. Reassembly.

(1) Reassemble the code-ring cage as indicated in figure 160; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the code-ring cage as described in paragraph 198*b*.

(3) Adjust the code-ring cage, as described in paragraph 65.

200. Disassembly and Reassembly of Transfer Lever Shaft

(fig. 161)

a. Disassembly.

(1) Remove the ribbon supply group as described in paragraph 182*a* for the TT–107/FG or paragraph 183*a* for the TT–107B/FG.

(2) Remove the front support assembly as described in paragraph 187*a* for the TT–107/FG or paragraph 188*a* for the TT–107B/FG.

(3) Move all the code-rings either clockwise or counterclockwise. Remove the self-locking hexagonal nut (1) that holds the flat washers (2, 4, 6, 8, and 10) and **T**-levers (3, 5, 7, 9, and 11) to the **T**-lever pivot stud (30); remove the flat washers and the **T**-levers.

(4) Remove the function clutch latch screw (12) that holds the clutch latch arm (17) to the transfer lever shaft (31); remove the clutch latch arm.

(5) Remove the machine screw (13), plain hexagonal nut (14), and lockwasher (15) that hold the ball bearing (16) to the clutch latch arm (17); remove the ball bearing.

(6) Remove the machine screw (18) that holds the shaft collar (19) to the transfer lever shaft (31); remove the shaft collar.

(7) Remove the transfer lever spring (20) from the transfer lever spring post (27) and from the spring post on the reperforator frame.

(8) Remove the machine screws (21 and 23) from the shaft collars (22 and 24). Remove the transfer lever shaft assembly by pulling it out from the front of the reperforator, catching the shaft collars as they fall from the transfer lever shaft (31).

(9) Remove the self-locking hexagonal nut (25) that holds the transfer lever roller stud (26) to the transfer lever; remove the transfer lever roller stud.

(10) Remove the transfer lever spring post (27) from the transfer lever.

(11) Remove the plain hexagonal nut (28) and lockwasher (29) that hold the T-lever pivot stud (30) to the transfer lever; remove the T-lever pivot stud.

(12) Remove the machine screw (32), flat washer (33), and nut plate (34) that hold the trip latch lever (35) to the trip latch lever shaft (38); remove the trip latch lever.

(13) Remove the transfer lever trip latch spring (36) from the transfer lever trip latch (39). Remove the assembled trip latch lever shaft (38) and transfer lever trip latch (39) from the reperforator frame. Remove the taper pin (37) and remove the trip latch lever shaft from the transfer lever trip latch.

b. Reassembly.

Note. If any of the T-levers are damaged and need to be replaced, replace all five of the T-levers. These levers are supplied in matched sets, and will not function properly when operated in unmatched sets.

(1) Reassemble the transfer lever shaft as indicated in figure 161; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the transfer lever and T-levers as described in paragraphs 51 through 57, 62, 67, and 118.

(3) Replace the front support assembly as described in paragraph 188*b* for the TT-107B/FG or paragraph 187*b* for the TT-107/FG.

(4) Replace the ribbon supply group as described in paragraph 183*b* for the TT-107B/FG or paragraph 182*b* for the TT-107/FG.

201. Disassembly and Reassembly of Function Shaft (TT–107/FG)

(fig. 162)

a. Disassembly.

(1) Remove the ribbon supply group as described in paragraph 182*a*.

(2) Remove the front support assembly as described in paragraph 187*a*.

(3) Remove the transfer lever shaft as described in paragraph 200*a*.

(4) Remove the two setscrews (4) that hold the transfer lever cam (5) to the function shaft (33); remove the transfer lever cam.

(5) Remove the two setscrews (6) that hold the sliding clutch coupling (7) to the function shaft; remove the sliding clutch coupling, sliding clutch spring (8), and sliding clutch drum (9).

(6) Remove the retainer ring (10) that holds the gear (12) to the function shaft (33); remove the flat washer (11), gear, and flat washer (13). Remove the retainer ring (14).

(7) Remove the two machine screws (15), lockwashers (16), and flat washer (17) that hold the ball bearing (23) in the rear frame of the reperforator. Remove the two machine screws (18), lockwashers (19), and flat washers (20) that hold the ball bearing (32) in the front frame of the reperforator.

(8) Remove the two setscrews (21) that hold the type wheel and function cam (30) to the function shaft (33). Remove the two setscrews (22) that hold the drive shaft collar (24) to the function shaft; slide the assembled function shaft and ball bearings (23 and 32) out from the front, catching the ball bearing (23), drive shaft collar, friction clutch spring (25), friction clutch plate (26), friction plate (27), function shaft drive gear (28), friction plate (29), type wheel and function cam (30), and flat washer (31) as they fall free of the function shaft.

(9) Remove the ball bearing (32) from the function shaft.

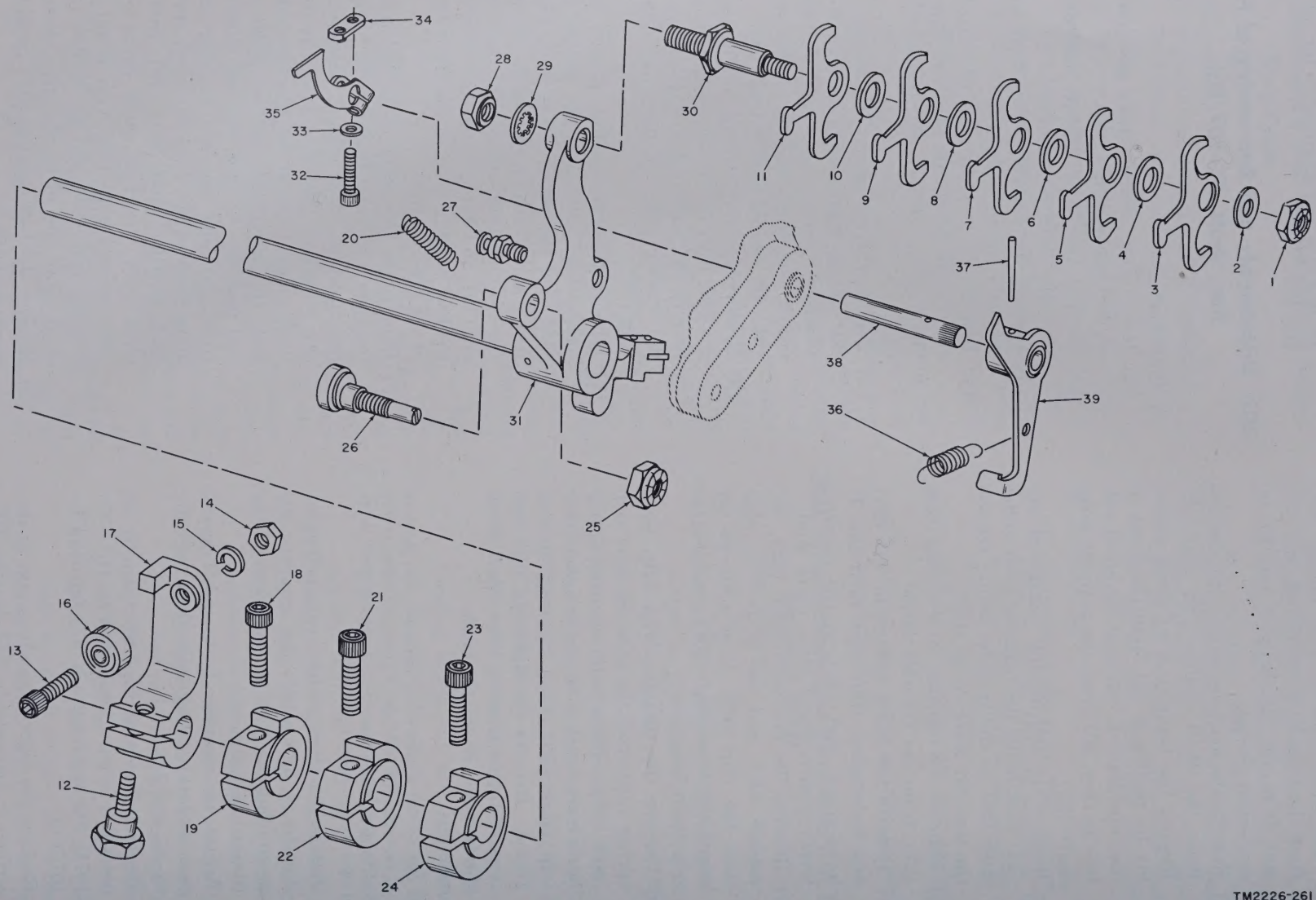


Figure 161. Transfer lever shaft, exploded view.

1 Self-locking hexagonal nut, 10500
2 Flat washer, 50414
3 T-lever, 51066A (includes items 5, 7, 9, and 11)
4 Flat washer, 50414
5 T-lever
6 Flat washer, 50414
7 T-lever
8 Flat washer, 50414
9 T-lever
10 Flat washer, 50414
11 T-lever
12 Function clutch latch screw, 52176
13 Machine screw, 10000
14 Plain hexagonal nut, 10504
15 Lockwasher, 10434
16 Ball bearing, 10754
17 Clutch latch arm, 50535
18 Machine screw, 10010
19 Shaft collar, 53973
20 Transfer lever spring, 50903
21 Machine screw, 10010
22 Shaft collar, 53973
23 Machine screw, 10010
24 Shaft collar, 53973
25 Self-locking hexagonal nut, 10501
26 Transfer lever roller stud, 56185
27 Transfer lever spring post, 50649
28 Plain hexagonal nut, 50651
29 Lockwasher, 10404
30 T-lever pivot stud, 50650
31 Transfer lever shaft, 54745A
32 Machine screw, 10006
33 Flat washer, 10459
34 Nut plate, 50174
35 Trip latch lever, 52147 (TT–107/FG), 56736 (TT–107B/FG)
36 Transfer lever trip latch spring, 50904
37 Taper pin, 10857
38 Trip latch lever shaft, 52148
39 Transfer lever trip latch, 50020A

Figure 161—Continued

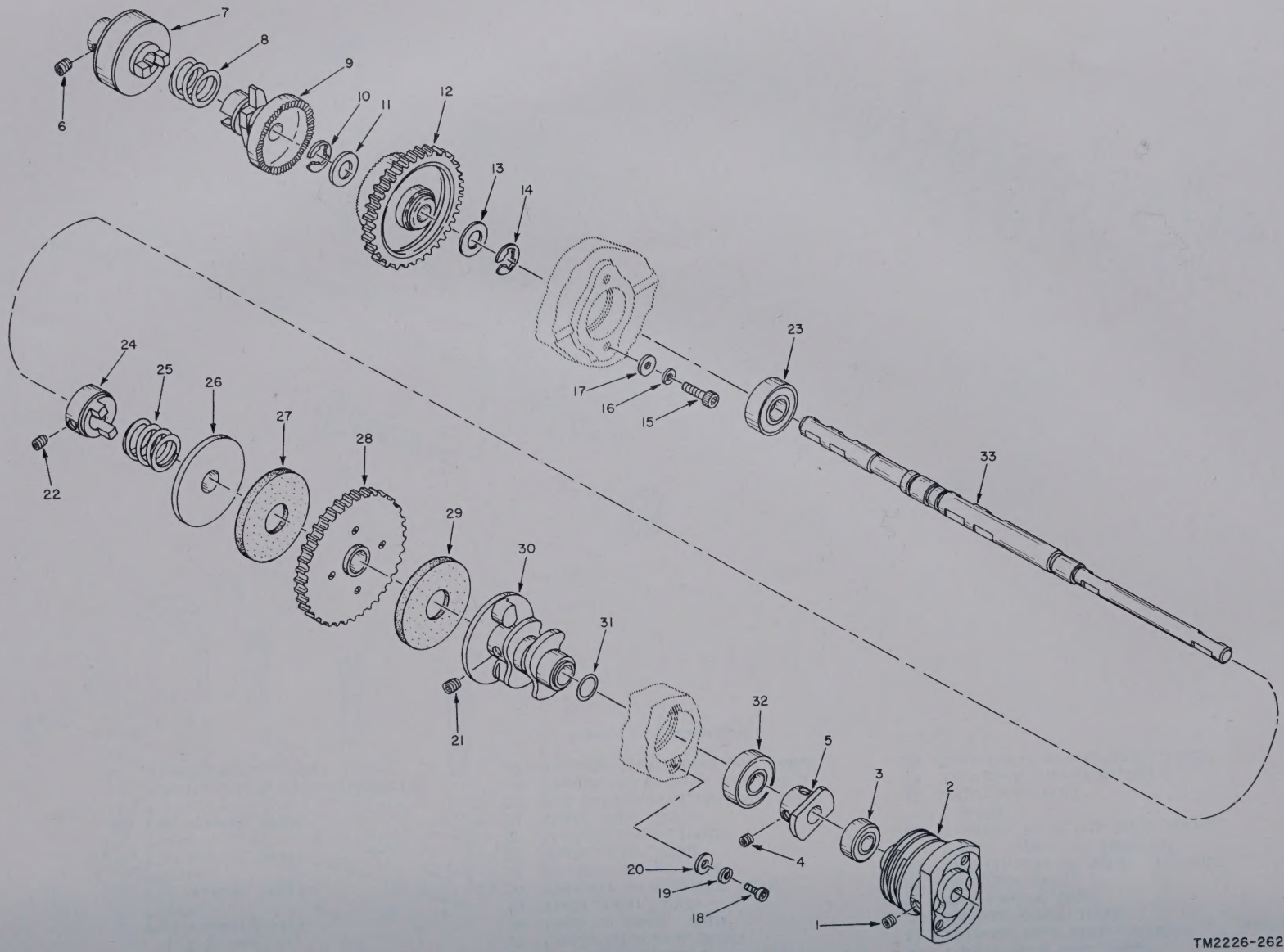


Figure 162. Function shaft, exploded view (TT–107/FG).

1 Setscrew, 10209
2 Print and register cam, 52456A
3 Ball bearing, 10753
4 Setscrew, 10209
5 Transfer lever cam, 50536
6 Setscrew, 10209
7 Sliding clutch coupling, 51167A
8 Sliding clutch spring, 50848
9 Sliding clutch drum, 50516
10 Retainer ring, 10959
11 Flat washer, 50515
12 Gear, 50512A
13 Flat washer, 50515
14 Retainer ring, 10959
15 Machine screw, 10004
16 Lockwasher, 10429
17 Flat washer, 10450
18 Machine screw, 10004
19 Lockwasher, 10429
20 Flat washer, 10450
21 Setscrew, 10209
22 Setscrew, 10209
23 Ball bearing, 10757
24 Drive shaft collar, 50492
25 Friction clutch spring, 50847
26 Friction clutch plate, 50491
27 Friction plate, 56273
28 Function shaft drive gear, 50496
29 Friction plate, 56273
30 Type wheel and function cam, 52398A
31 Flat washer, 52283
32 Ball bearing, 10756
33 Function shaft, 52333

Figure 162—Continued

b. Reassembly.

(1) Reassemble the function shaft as indicated in figure 162; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the transfer lever shaft as described in paragraph 200*b*.

(3) Replace the front support assembly as described in paragraph 187*b*.

(4) Replace the ribbon supply group as described in paragraph 182*b*.

(5) Adjust the function shaft as described in paragraphs 49, 55, and 66.

202. Disassembly and Reassembly of Function Shaft (TT–107B/FG)

(fig. 163)

a. Disassembly.

(1) Remove the tape puller mechanism as described in paragraph 176*a*.

(2) Remove the ribbon supply group as described in paragraph 183*a*.

(3) Loosen the machine screw that holds the bearing (10) in the rear frame of the reperforator.

(4) Remove the two machine screws and lockwashers that hold the bearing cap to the front support frame.

(5) Remove the two setscrews (1) that hold the sliding clutch coupling (2) to the function shaft (27); remove the sliding clutch coupling, sliding clutch spring (3), and sliding clutch drum (4).

(6) Remove the retainer ring (5) that holds the gear (7) to the function shaft; remove the flat washer (6), gear, and flat washer (8).

(7) Remove the retainer ring (9) that holds the ball bearing (10) to the function shaft (27); remove the ball bearing.

(8) Remove the two setscrews (11) that hold the print and register cam (12) to the function shaft (27); remove the print and register cam and the bearing block.

(9) Remove the two setscrews (13) that hold the transfer lever cam (14) to the function shaft (27); remove the transfer lever cam.

(10) Pull the function shaft to the rear through the ball bearing (31) in the reperforator frame; remove the flat washer (15).

(11) Remove the two setscrews (16) that hold the type wheel and function lever cam (17) to the function shaft (27); remove the type wheel and function lever cam, friction plate (18), function shaft drive gear (19), friction plate (20), friction clutch plate (21), and friction clutch spring (22).

(12) Remove the two machine screws (23) that hold the friction adjusting collar (24) to the drive shaft collar (26); remove the two halves of the friction adjusting collar.

(13) Remove the two setscrews (25) that hold the drive shaft collar (26) to the function shaft (27); remove the drive shaft collar.

(14) Remove the two machine screws (28), lockwashers (29), and flat washers (30) that hold the ball bearing (31) to the reperforator frame; remove the ball bearing.

b. Reassembly.

(1) Reassemble the function shaft as indicated in figure 163; the sequence for reassembling the parts is the reverse of the disassembly sequence except when assembling the bearings which must be assembled as follows:

(*a*) Position the bearing cap on the front support frame; secure with two machine screws and lockwashers.

(*b*) Tighten the machine screw in the rear frame of the reperforator to secure the bearing (10).

(2) Replace the ribbon supply group as described in paragraph 183*b*.

(3) Replace the tape puller mechanism as described in paragraph 176*b*.

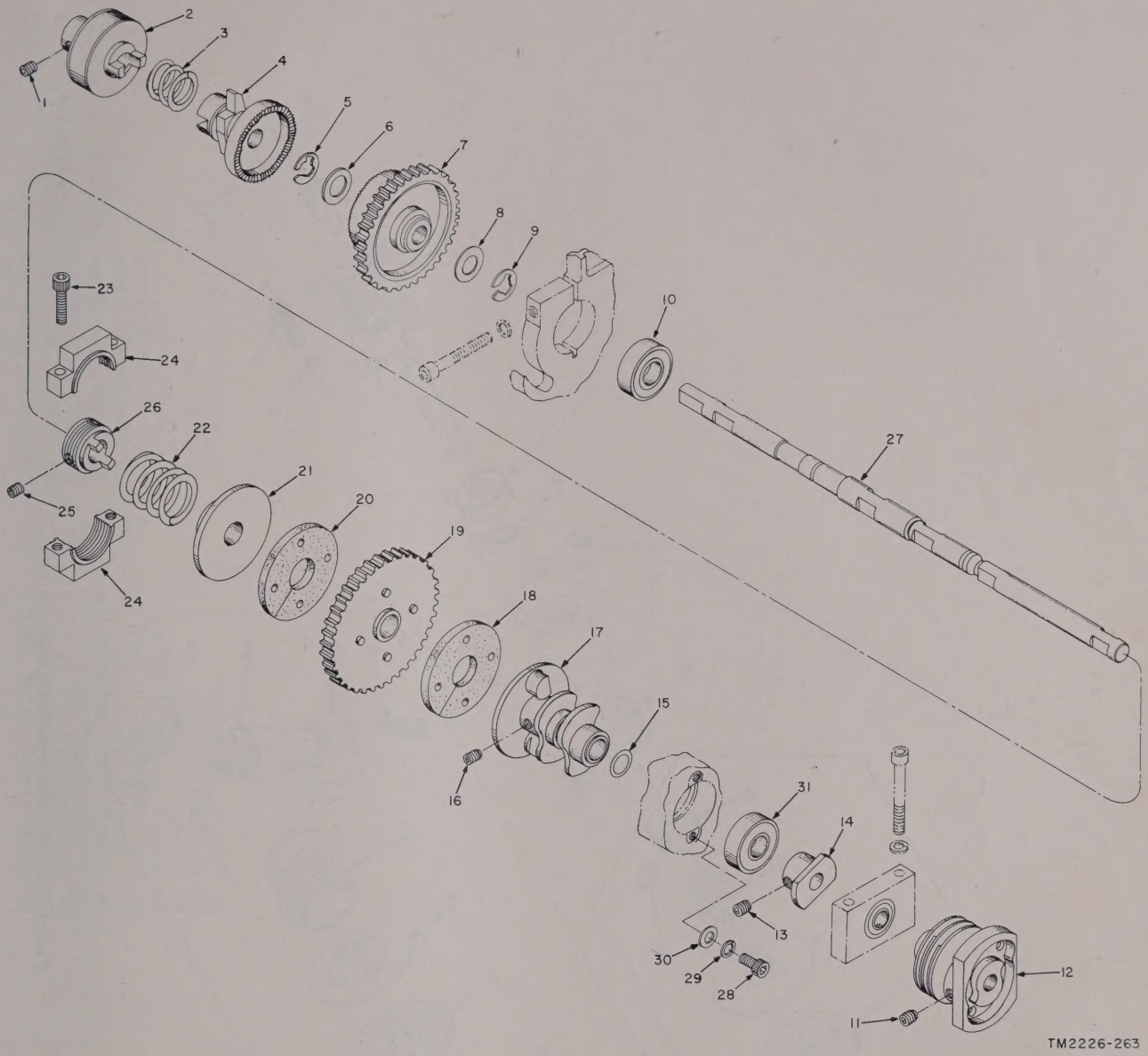
(4) Adjust the function shaft as described in paragraphs 45, 49, 55, and 66.

203. Disassembly and Reassembly of Selector Camshaft

(fig. 164)

a. Disassembly.

(1) On the TT–107B/FG, remove the tape puller mechanism from the front support frame as described in paragraph 176*a*(1).



1 Setscrew, 10209
2 Sliding clutch coupling, 51167A
3 Sliding clutch spring, 50848
4 Sliding clutch drum, 50516
5 Retainer ring, 10959
6 Flat washer, 50515
7 Gear, 50512A
8 Flat washer, 50515
9 Retainer ring, 10959
10 Ball bearing, 10756
11 Setscrew, 10209
12 Print and register cam, 52456A
13 Setscrew, 10209
14 Transfer lever cam, 50536
15 Flat washer, 52283
16 Setscrew, 10209
17 Type wheel and function lever cam, 52398
18 Friction plate, 56764
19 Function shaft drive gear, 56330A
20 Friction plate, 56764
21 Friction clutch plate, 56248
22 Friction clutch spring, 56249
23 Machine screw, 10034
24 Friction adjusting collar, 56382
25 Setscrew, 10208
26 Drive shaft collar, 56246
27 Function shaft, 57159
28 Machine screw, 10004
29 Lockwasher, 10429
30 Flat washer, 10450
31 Ball bearing, 10756

Figure 163. Function shaft, exploded view (TT–107B/FG).

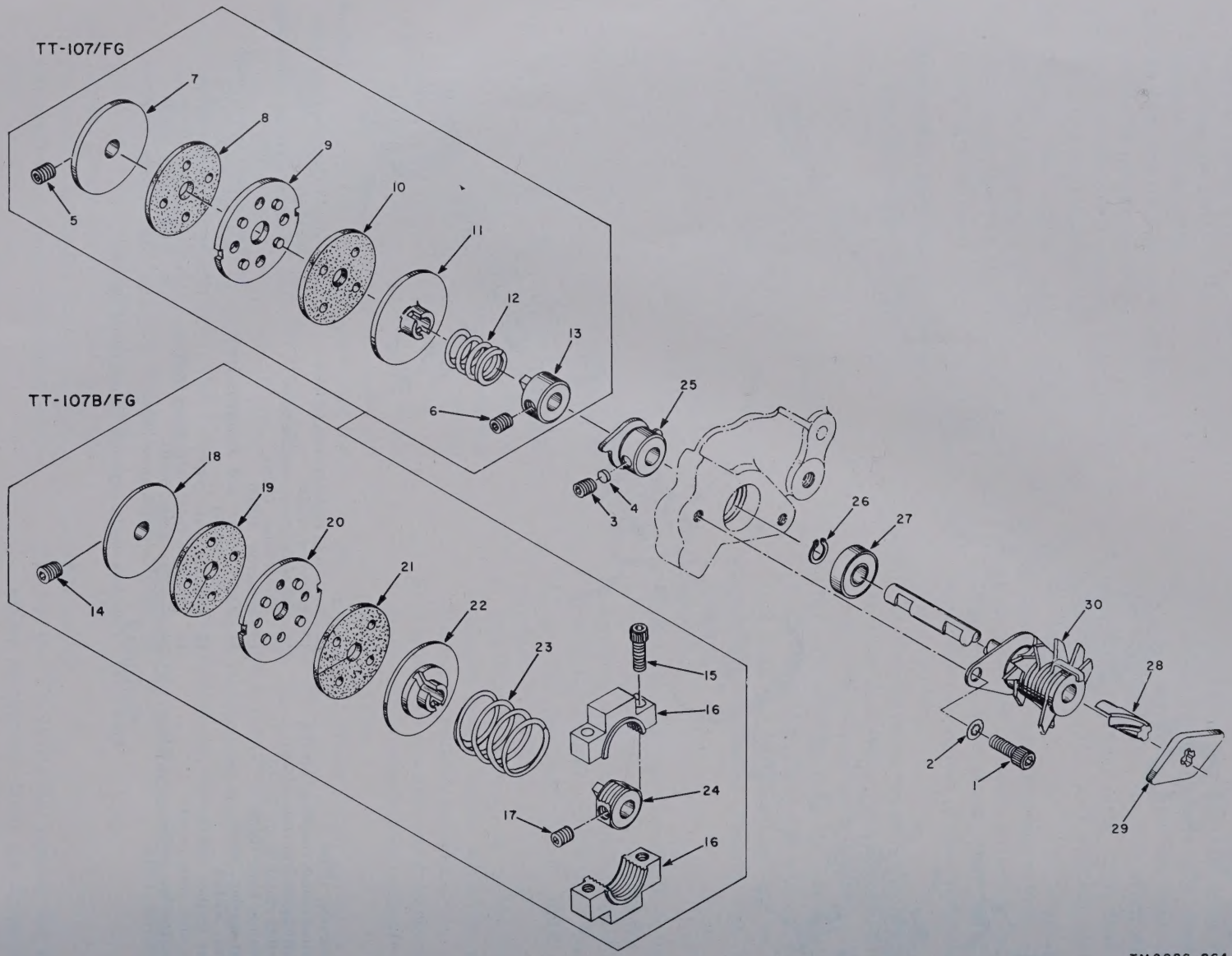


Figure 164. Selector camshaft, exploded view.

1 Machine screw, 10003
2 Lockwasher, 10403
3 Setscrew, 10208
4 Setscrew seat, 52159
5 Setscrew, 10209
6 Setscrew, 10208
7 Friction clutch disk, 50200
8 Friction plate, 50013
9 Driving disk, 51117
10 Friction plate, 50013
11 Friction clutch plate, 50198
12 Friction clutch spring, 50914
13 Drive shaft collar, 50199
14 Setscrew, 10209
15 Machine screw, 10005
16 Friction clutch adjusting collar, 56381
17 Setscrew, 10208
18 Friction clutch disk, 50200
19 Friction plate, 56765
20 Driving disk, 51117
21 Friction plate, 56765
22 Friction clutch plate, 54931
23 Friction clutch spring, 54932
24 Drive shaft collar, 54928
25 Manual tape feed-out cam, 52158
26 Retainer ring, 10462
27 Ball bearing, 10753
28 Spindle, 50133
29 Plate, 50134
30 Selector camshaft, 51398A

Figure 164—Continued

(2) Remove the rangefinder from the reperforator as described in paragraph 179*a* for the TT–107/FG and paragraph 180*a* for the TT–107B/FG.

(3) Remove the two machine screws (1) and lockwashers (2) that hold the selector camshaft (30) to the reperforator frame.

(4) Remove the two setscrews (3) and setscrew seats (4) that hold the manual tape feed-out cam (25) to the selector camshaft (30).

(5) On the TT–107/FG, remove the two setscrews (5) that hold the friction clutch disk (7) to the selector camshaft (30). Remove the two setscrews (6) that hold the drive shaft collar (13) to the selector camshaft. Remove the assembled selector camshaft and ball bearing (27) from the reperforator frame; catch the friction clutch disk, friction plate (8), driving disk (9), friction plate (10), friction clutch plate (11), friction clutch spring (12), drive shaft collar, and manual tape feed-out cam (25) as they fall from the selector camshaft.

(6) On the TT–107B/FG, remove the two setscrews (14) that hold the friction clutch disk (18) to the selector camshaft (30). Remove the two machine screws (15) that hold the friction clutch adjusting collar (16) to the drive shaft collar (24); remove the two halves of the friction clutch adjusting collar. Remove the two setscrews (17) that hold the drive shaft collar to the selector camshaft. Remove the assembled selector camshaft and ball bearing (27) from the reperforator frame; catch the friction clutch disk, friction plate (19), driving disk (20), friction plate (21), friction clutch plate (22), friction clutch spring (23), drive shaft collar, and manual tape feed-out cam (25) as they fall from the selector camshaft.

(7) Remove the retainer ring (26) that holds the ball bearing (27) to the selector camshaft; remove the ball bearing.

(8) Remove the grooved spindle (28) and plate (29) from the end of the selector camshaft (30).

b. Reassembly.

(1) Reassemble the selector camshaft as indicated in figure 164; the sequence for assembling the parts is the reverse of the disassembly sequence. Make certain that the friction clutch driving disk (9, TT–107/FG or 20, TT–107B/FG) on the selector camshaft is engaged by the friction clutch drive assembly on the main shaft.

(2) Replace the rangefinder as described in paragraph 180*b* for the TT–107B/FG or paragraph 179*b* for TT–107/FG.

(3) Adjust the selector camshaft as described in paragraph 112, 113, or 117.

(4) On the TT–107B/FG, replace the tape puller mechanism as described in paragraph 176*b*.

204. Disassembly and Reassembly of Main (fig. 165) Shaft (TT–107/FG)

a. Disassembly.

(1) Remove the selector camshaft from the reperforator as described in paragraph 203*a*.

(2) Remove the machine screw (1) and lockwasher (2) that hold the main shaft driven gear (3) to the main shaft (14); remove the main shaft driven gear.

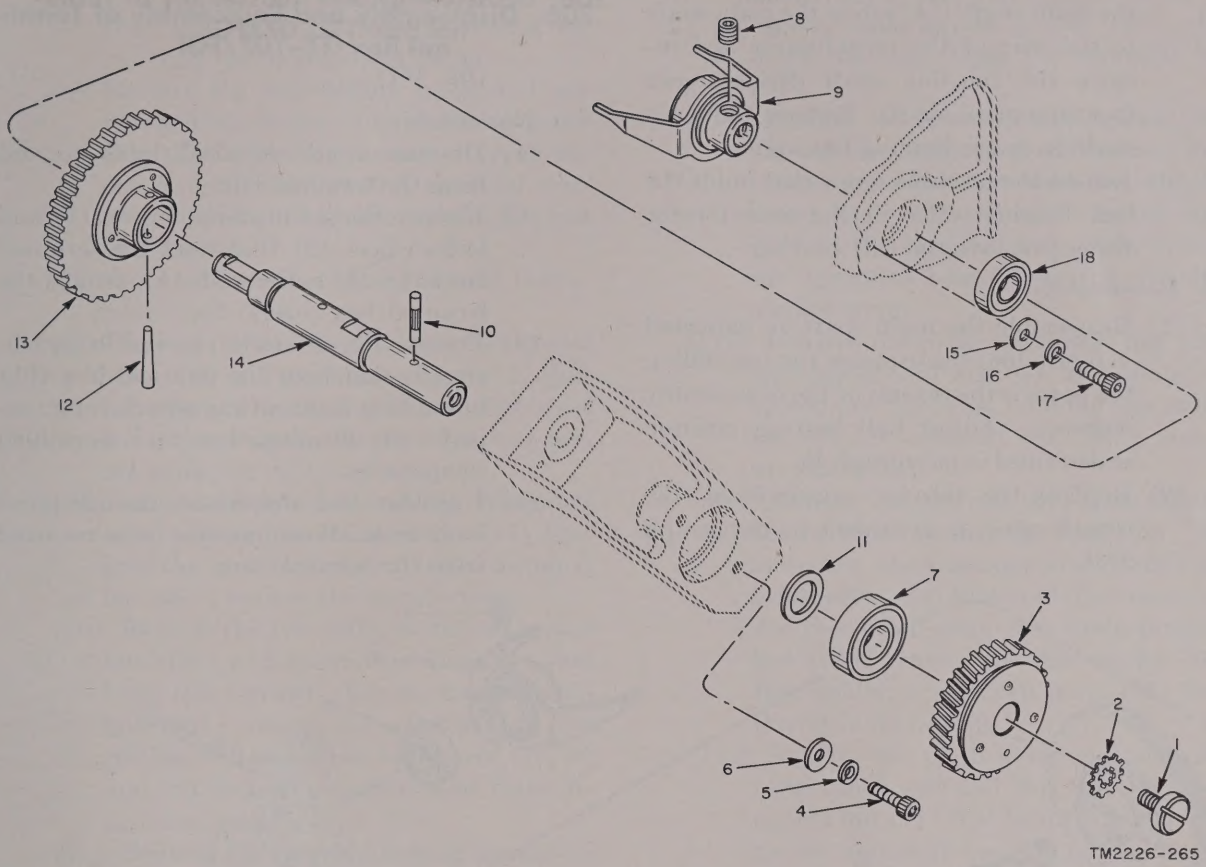
(3) Remove the two machine screws (4), lockwashers (5), and flat washers (6) that hold the ball bearing (7) in the bearing bracket; remove the ball bearing.

(4) Remove the two setscrews (8) that hold the friction clutch drive assembly (9) to the main shaft (14); remove the friction clutch drive assembly from the main shaft.

(5) Remove the gear pin (10) from the main shaft (14); slide the flat washer (11) off the main shaft.

(6) Remove the taper pin (12) that holds the function shaft driving gear (13) to the main shaft (14); slide the main shaft to the rear of the reperforator and remove the function shaft driving gear from the main shaft. Remove the main shaft from the bearing bracket.

(7) Remove the two machine screws (17), lockwashers (16), and flat washers (15) that hold the ball bearing (18) in the re-



1 Machine screw, 50207
2 Lockwasher, 10406
3 Main shaft driven gear, 50352A
4 Machine screw, 10004
5 Lockwasher, 10429
6 Flat washer, 10450
7 Ball bearing, 10758
8 Setscrew, 10209
9 Friction clutch drive assembly, 50484A
10 Gear pin, 50359
11 Flat washer, 50746
12 Taper pin, 10852
13 Function shaft driving gear, 50354A
14 Main shaft, 52338
15 Flat washer, 10450
16 Lockwasher, 10429
17 Machine screw, 10004
18 Ball bearing, 10757

Figure 165. Reperforator main shaft, exploded view (TT–107/FG).

perforator frame; remove the ball bearing (18).

b. Reassembly.

(1) Reassemble the main shaft as indicated in figure 165; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the selector camshaft on the reperforator as described in paragraph 203*b*.

205. Disassembly and Reassembly of Main Shaft (TT–107B/FG)

a. Disassembly.

(1) Remove the selector camshaft from the reperforator as described in paragraph 203*a*.

(2) Remove the machine screw (1) and lockwasher (2) that hold the main shaft driven gear (3) to the main shaft (14); remove the main shaft driven gear and gear key (4).

(3) Remove the two machine screws (5), lockwashers (6), and flat washers (7) that hold the ball bearing (8) in the bearing bracket; remove the ball bearing.

(4) Remove the two setscrews (9) that hold the friction clutch drive assembly (10) to the main shaft (14); remove the friction clutch drive assembly from the main shaft. Slide the flat washer (11) off the main shaft.

(5) Remove the taper pin (12) that holds the function shaft driving gear (13) to

the main shaft (14); slide the main shaft to the rear of the reperforator and remove the function shaft driving gear from the main shaft. Remove the main shaft from the bearing bracket.

(6) Loosen the machine screw that holds the ball bearing (15) in the reperforator frame; remove the ball bearing.

b. Reassembly.

(1) Reassemble the main shaft as indicated in figure 166; the sequence for assembling the parts is the reverse of the disassembly sequence. Adjust ball bearing position as described in paragraph 45.

(2) Replace the selector camshaft on the reperforator as described in paragraph 203*b*.

206. Disassembly and Reassembly of Terminal Box (TT–107/FG)

(fig. 167)

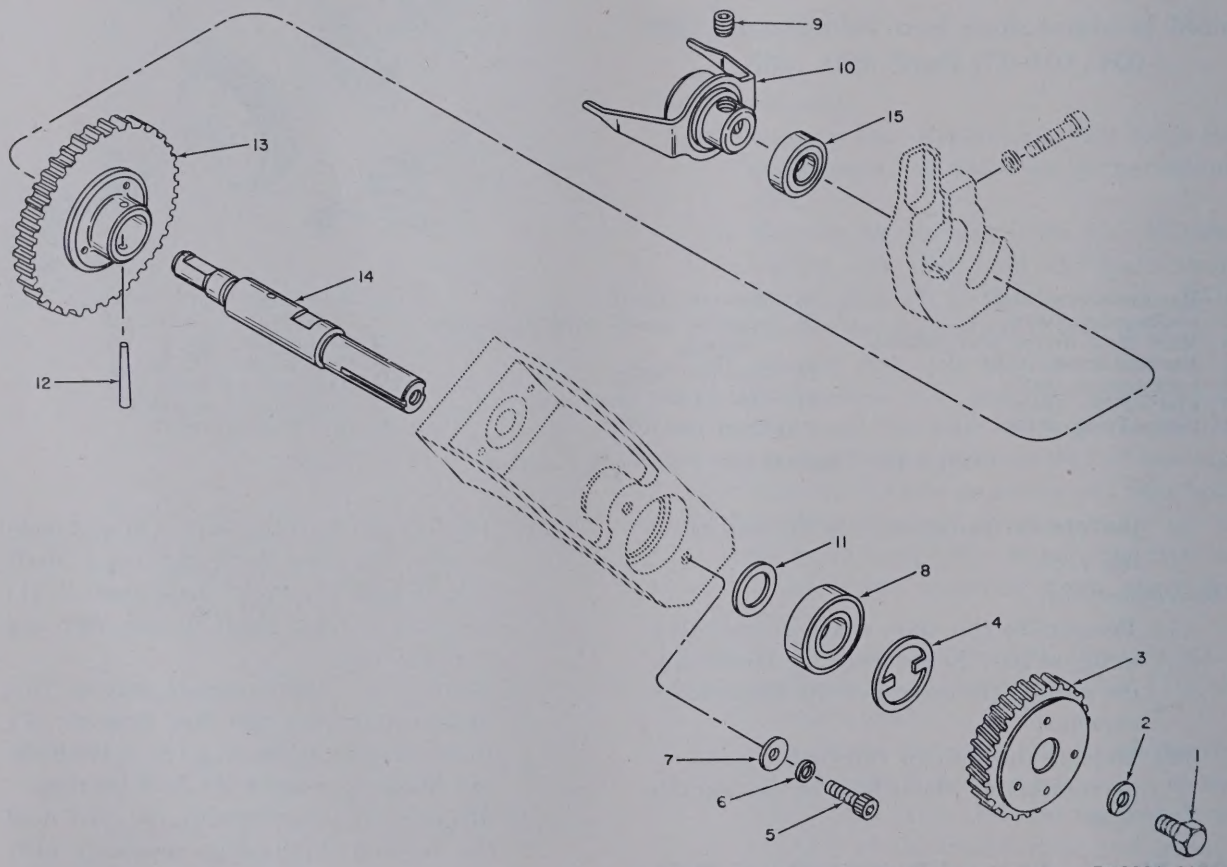
a. Disassembly.

(1) Disconnect all electrical leads to and from the terminal box.

(2) Remove the six machine screws (1) and lockwashers (2) that hold the terminal box cover (3) to the studs (4); remove the terminal box cover.

(3) Remove the six studs (4) and lockwashers (5) that hold the terminal box (91) to the base frame of the reperforator; remove the terminal box and assembled components.

(4) Unsolder and disconnect the electrical leads from all components to be removed from the terminal box.



1 Machine screw, 56124
2 Lockwasher, 10438
3 Main shaft driven gear, 50352A
4 Gear key, 54566
5 Machine screw, 10004
6 Lockwasher, 10429
7 Flat washer, 10450
8 Ball bearing, 10758
9 Setscrew, 10209
10 Friction clutch drive assembly, 50484A
11 Flat washer, 50746
12 Taper pin, 10852
13 Function shaft driving gear, 50354A
14 Main shaft, 57142
15 Ball bearing, 10757

Figure 166. Reperforator main shaft, exploded view (TT–107B/FG).

(5) Remove the self-locking hexagonal nut (6), cable clamp (7), and machine screw (8) from the terminal box (91).

(6) Remove the self-locking hexagonal nut (9), machine screw (10), and lockwasher (11) that hold the grounding lug on the power cord (13) to the terminal box (91); remove the strain relief (12) and power cord.

(7) Remove the strain relief (14) and the receive cord (15).

(8) Remove the four self-locking hexagonal nuts (16) and machine screws (17) that hold the two brackets (18) to the terminal box (91); remove the two brackets and the capacitor (19).

(9) Remove the two self-locking hexagonal nuts (20) and machine screws (21) that hold the transformer (22) to the terminal box (91); remove the transformer.

(10) Remove the two self-locking hexagonal nuts (23) and machine screws (24) that hold the rectifier (26) to the terminal box (91); remove the resistor (25) and rectifier. Remove the lead wires (27, 28, and 29) from the rectifier and from the terminal board (53).

(11) Remove the two self-locking hexagonal nuts (30) and machine screws (31) that hold the copy light socket (32) to the terminal box (91); remove the copy light socket.

(12) Remove the two self-locking hexagonal nuts (33), cable clamps (34), lockwashers (35), and machine screws (36) that hold the tape out alarm cable (37) to the terminal box (91); remove the tape out alarm cable.

(13) Remove the two self-locking hexagonal nuts (38) and machine screws (39) that hold the capacitor (40) to the terminal box (91); remove the capacitor.

(14) Remove the machine screw (41), self-locking hexagonal nut (42), and lockwasher (43) that hold the grounding lug on the cable assembly (45) to the terminal box (91). Remove the plain hexagonal nut (44) that holds the cable assembly to the terminal box; remove the cable assembly.

(15) Remove the plain hexagonal nut (46) and lockwasher (47) that hold the resistor (48) to the stud (50); remove the resistor and the flat washer (49). Remove the stud from the terminal box (91).

(16) Remove the four machine screws (51), flat washers (52), and self-locking hexagonal nut (53) that hold the terminal board (54) and terminal marker strip (55) to the terminal box (91); remove the terminal board and the terminal marker strip.

(17) Remove the plain hexagonal nut (56), lockwashers (57 and 58), and plain hexagonal nut (59) that hold the line switch (60) to the terminal box (91); remove the line switch.

(18) Remove the fuse cap (61) from the fuse holder (66); remove the fuse (62). Remove the plain hexagonal nut (63) and lockwasher (64) that hold the fuse holder and the switch plate (67) to the terminal box (91); remove the flat washer (65), fuse holder, and switch plate (67) from the terminal box (91).

(19) Remove the plain hexagonal nut (68), lockwashers (69 and 70), and plain hexagonal nut (71) that hold the switch (72) to the terminal box (91); remove the switch.

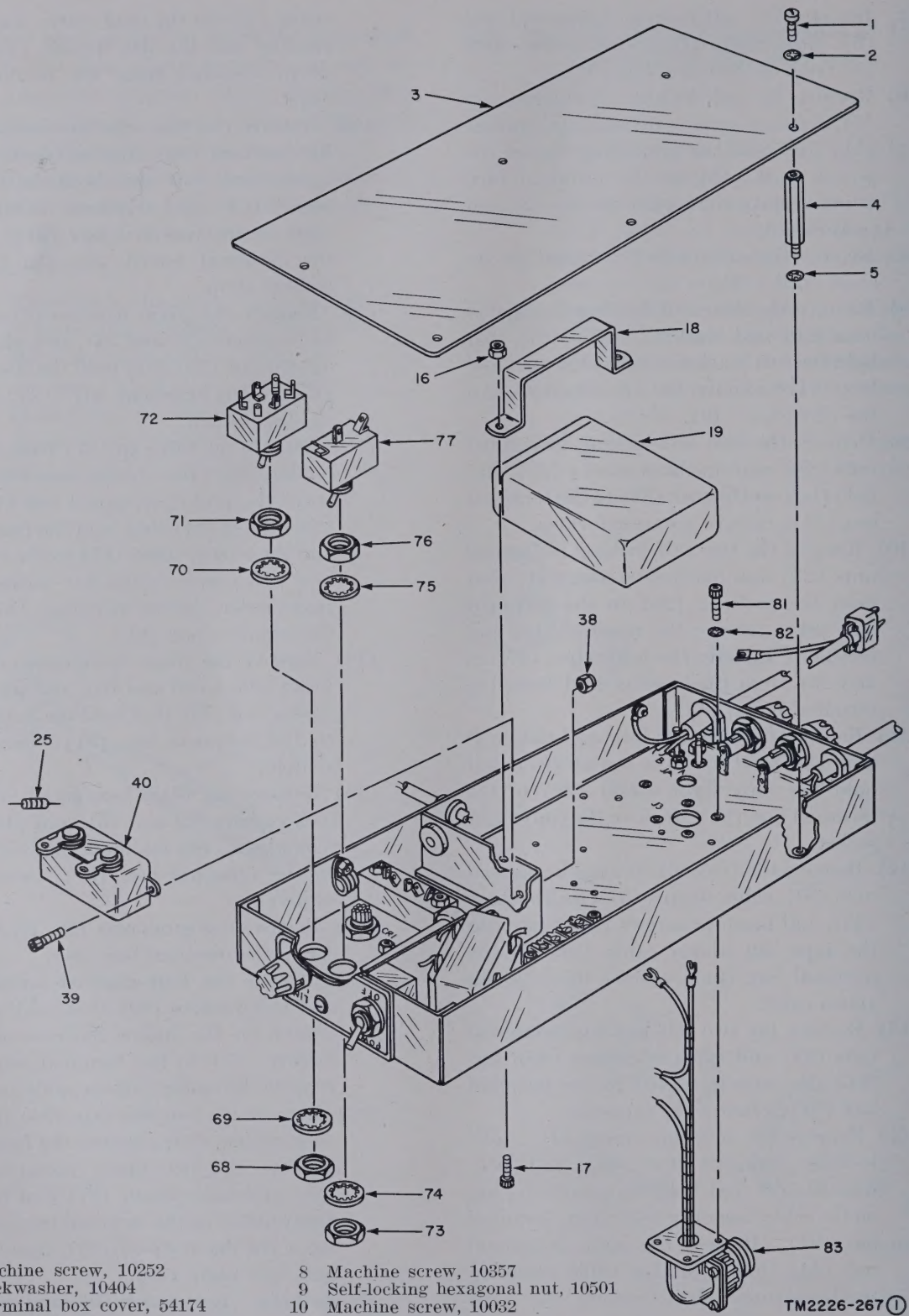
(20) Remove the plain hexagonal nut (73), lockwashers (74 and 75), and plain hexagonal nut (76) that hold the switch (77) to the terminal box (91); remove the switch.

(21) Remove the grommets (78, 79, and 80) from the terminal box (91).

(22) Remove the four machine screws (81) and lockwashers (82) that hold the connector on the motor harness cable assembly (83) to the terminal box (91); remove the motor harness cable assembly.

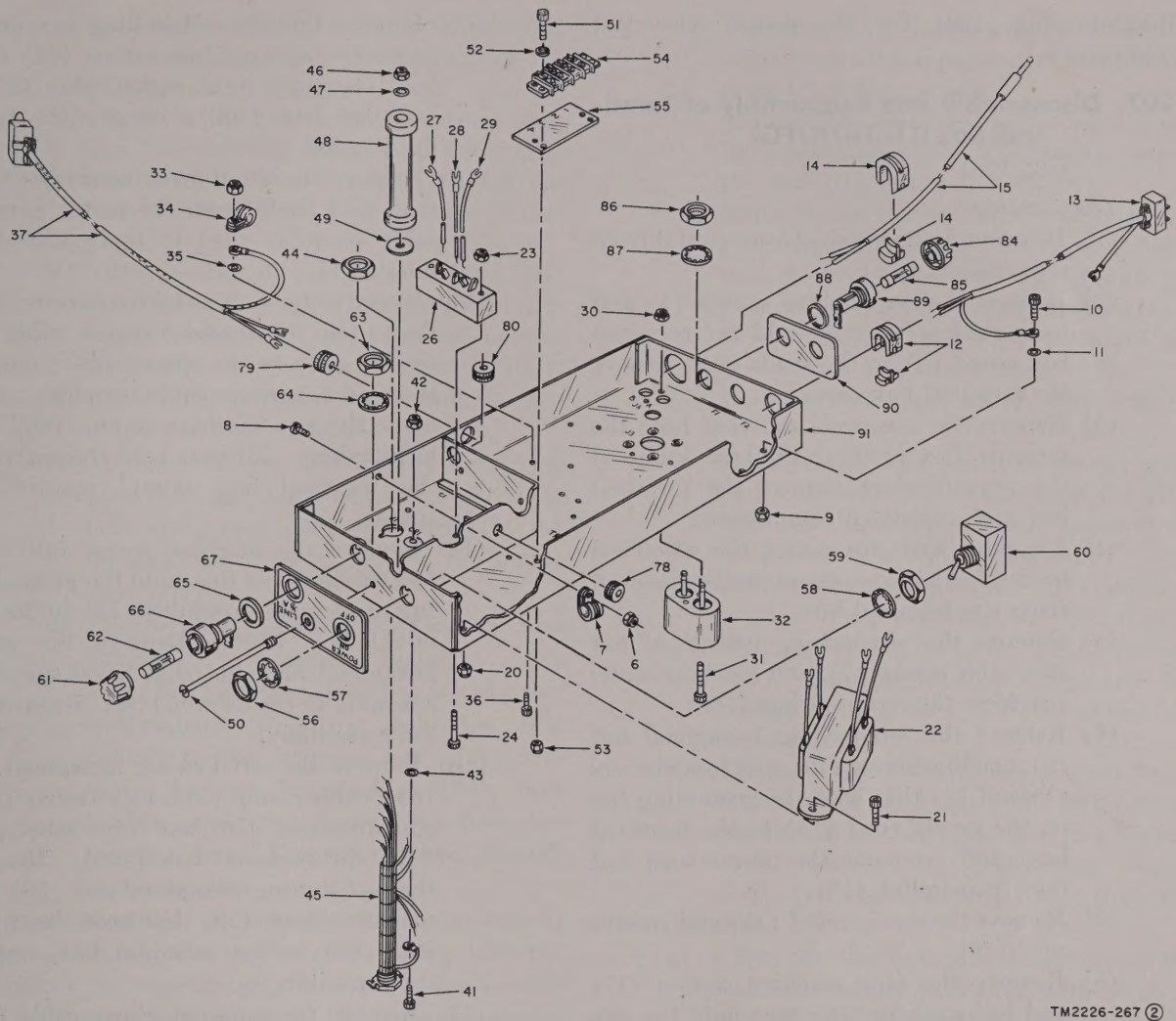
(23) Remove the two fuse caps (84) from the fuse holders (89); remove the fuses (85). Remove the two plain hexagonal nuts (86) and lockwashers (87) that hold the fuse holders to the terminal box (91); remove the flat washers (88), fuse holders, and fuse plate (90).

b. Reassembly. Reassemble the components of the terminal box as indicated in figure 167; the sequence for assembling the parts is the reverse of the disassembly sequence. Refer to the wiring



1 Machine screw, 10252
2 Lockwasher, 10404
3 Terminal box cover, 54174
4 Stud, 54183
5 Lockwasher, 10404
6 Self-locking hexagonal nut, 10500
7 Cable clamp, 20513
8 Machine screw, 10357
9 Self-locking hexagonal nut, 10501
10 Machine screw, 10032
11 Lockwasher, 10404
12 Strain relief, 20835
13 Power cord, 52571A
14 Strain relief, 20713
15 Receive cord, 53376A
16 Self-locking hexagonal nut, 10500
17 Machine screw, 10003

Figure 167. Terminal box, exploded view (TT–107/FG).



18 Bracket, 54206
19 Capacitor (C2), 53625
20 Self-locking hexagonal nut, 10500
21 Machine screw, 10003
22 Transformer (T1), 53667A
23 Self-locking hexagonal nut, 10500
24 Machine screw, 10041
25 Resistor (R2), 20010
26 Rectifier (CR1), 20802
27 Lead wire (white), 22099–01
28 Lead wire (white/blue), 54204A
29 Lead wire (block/white), 54203A
30 Self-locking hexagonal nut, 10501
31 Machine screw, 10013
32 Copy light socket, 53320A
33 Self-locking hexagonal nut, 10500
34 Cable clamp, 20519
35 Lockwasher, 10403
36 Machine screw, 10004
37 Tape-out alarm cable, 54135A
38 Self-locking hexagonal nut, 10500
39 Machine screw, 10003
40 Capacitor (C1), 20213
41 Machine screw, 10003
42 Self-locking hexagonal nut, 10500
43 Lockwasher, 10403
44 Plain hexagonal nut
45 Cable assembly, 54164A (includes item 44)
46 Plain hexagonal nut, 10515
47 Lockwasher, 10404
48 Resistor (R1), 20011
49 Flat washer, 10463
50 Stud, 10361
51 Machine screw, 10005
52 Flat washer, 10458
53 Self-locking hexagonal nut, 10500
54 Terminal board (TB1), 20368
55 Terminal marker strip, 20388
56 Plain hexagonal nut
57 Lockwasher
58 Lockwasher
59 Plain hexagonal nut
60 Line switch (S1), 20115 (includes items 56 through 59)
61 Fuse cap
62 Fuse (F3), 20451
63 Plain hexagonal nut
64 Lockwasher
65 Flat washer
66 Fuse holder, 20458 (includes items 61, 63, 64, and 65)
67 Switch plate, 54207
68 Plain hexagonal nut
69 Lockwasher
70 Lockwasher
71 Plain hexagonal nut
72 Switch (S3), 20121 (includes items 68 through 71)
73 Plain hexagonal nut
74 Lockwasher
75 Lockwasher
76 Plain hexagonal nut
77 Switch (S2), 20117 (includes items 73 through 76)
78 Grommet, 20725
79 Grommet, 20726
80 Grommet, 21000
81 Machine screw, 10047
82 Lockwasher, 10408
83 Motor harness cable assembly, 54163A
84 Fuse cap
85 Fuse (F1, F2), 20455
86 Plain hexagonal nut
87 Lockwasher
88 Flat washer
89 Fuse holder, 20458 (includes items 84, 86, 87, and 88)
90 Fuse plate, 54208
91 Terminal box, 54210A

Figure 167.—Continued

diagram (fig. 129) for the proper electrical connections.

207. Disassembly and Reassembly of Terminal Box (TT–107B/FG)

(fig. 168)

a. Disassembly.

(1) Disconnect all electrical leads to and from the terminal box.

(2) Remove the six machine screws (1) and lockwashers (2) that hold the terminal box cover (3) to the studs (4); remove the terminal box cover.

(3) Remove the six studs (4) that hold the terminal box (100) to the base frame of the reperforator; remove the terminal box and assembled components.

(4) Unsolder and disconnect the electrical leads from all components to be removed from the terminal box.

(5) Remove the self-locking hexagonal nut (6), cable clamp (7), and machine screw (8) from the terminal box (100).

(6) Remove the self-locking hexagonal nut (9), machine screw (10), and lockwashers (11 and 12) that hold the grounding lug on the power cord (14) to the terminal box (100); remove the power cord and the strain relief (13).

(7) Remove the strain relief (15) and receive cord (16).

(8) Remove the four machine screws (17) and lockwashers (18) that hold the two brackets (19) to the terminal box (100); remove the brackets and the capacitor (20).

(9) Remove the machine screw (21) and lockwasher (22), catching the flat washer (23), centering washer (24), resistor (25), centering washer (26), and flat washer (27) as they fall free.

(10) Remove the machine screw (28), lockwasher (29), and nut plate (30), catching the flat washer (31), centering washer (32), resistor (33), centering washer (34), and flat washer (35) as they fall free.

(11) Remove the two machine screws (36) and lockwashers (37) that hold the rectifier (38) to the terminal box (100); remove the rectifier. Remove the resistor (39).

(12) Remove the two self-locking hexagonal nuts (40) and machine screw (41) that hold the copy light socket (42) to the terminal box (100); remove the copy light socket.

(13) Remove the three machine screws (43) that hold leads from the motor harness cable assembly (45) to the motor start relay (91).

(14) Remove the four machine screws (44) that hold the motor harness cable assembly (45) to the spacer (48); remove the motor harness cable assembly. Remove the two machine screws (46) and lockwashers (47) that hold the spacer to the terminal box (100); remove the spacer.

(15) Remove the machine screw (49) and lockwasher (50) that hold the grounding lug on the cable assembly (52) to the terminal box (100). Remove the plain hexagonal nut (51) that holds the cable assembly to the terminal box; remove the cable assembly.

(16) Remove the self-locking hexagonal nut (53), cable clamp (54), lockwasher (55), machine screw (56), and lockwasher (57) from the terminal box (100). Remove the self-locking hexagonal nut (58) and machine screw (59) that hold the capacitor (60) to the terminal box, remove the capacitor.

(17) Remove the tape out alarm cable (61) from the terminal box (100).

(18) Remove the two machine screws (62) and lockwashers (63) that hold the transformer (64) to the terminal box (100); remove the transformer.

(19) Remove the plain hexagonal nut (65), lockwashers (66 and 67), and plain hexagonal nut (68) that hold the power switch (69) to the terminal box (100); remove the power switch.

(20) Remove the grommets (70 and 71) from the terminal box (100).

(21) Remove the plain hexagonal nut (72), lockwashers (73 and 74), and plain hexagonal nut (75) that hold the switch (76) to the terminal box (100); remove the switch.

(22) Remove the plain hexagonal nut (77), lockwashers (78 and 79), and plain hex-

agonal nut (80) that hold the switch (81) to the terminal box (100); remove the switch.

(23) Remove the two machine screws (83) and self-locking hexagonal nuts (82) that hold the switch plate (84) to the terminal box (100); remove the switch plate.

(24) Remove the four machine screws (85) and lockwashers (86) that hold the terminal board (87) and terminal marker strip (88) to the terminal box (100); remove the terminal board and the terminal marking strip.

(25) Remove the two self-locking hexagonal nuts (89) and machine screws (90) that hold the motor start relay (91) to the terminal box (100); remove the motor start relay.

(26) Remove the fuse caps (92) from the fuse holders (97); remove the fuses (93). Remove the plain hexagonal nuts (94) and lockwashers (95) that hold the fuse holders to the terminal box (100); remove the two flat washers (96), fuse holders, and fuse plates (98) from the terminal box. Remove the two grounding posts (99).

b. Reassembly. Reassemble the components of the terminal box as indicated in figure 168; the sequence for assembling the parts is the reverse of the disassembly sequence. Refer to the wiring diagram (fig. 130) for the proper electrical connections.

208. Disassembly and Reassembly of Terminal Box (TT–109/FG)

(fig. 169)

a. Disassembly.

(1) Disconnect all electrical leads to and from the terminal box.

(2) Remove the six machine screws (1) and lockwashers (2) that hold the terminal box cover (3) to the studs (4); remove the terminal box cover.

(3) Remove the six studs (4) and lockwashers (5) that hold the terminal box (106) to the base frame of the reperforator; remove the terminal box and assembled components.

(4) Unsolder and disconnect the electrical leads from all components to be removed from the terminal box.

(5) Remove the self-locking hexagonal nut (6), cable clamp (7), and machine screw (8) from the terminal box (106).

(6) Remove the self-locking hexagonal nut (9), machine screw (10), and lockwashers (11 and 12) that hold the grounding lug on the power cord (14) to the terminal box (106); remove the power cord and strain relief (13).

(7) Remove the strain relief (15) and receive cord (16).

(8) Remove the four machine screws (17) and lockwashers (18) that hold the filter (19) to the terminal box; remove the filter and four lockwashers (20).

(9) Remove the machine screw (21) and lockwasher (22), catching the flat washer (23), centering washer (24), resistor (25), centering washer (26), and flat washer (27) as they fall free of the machine screw.

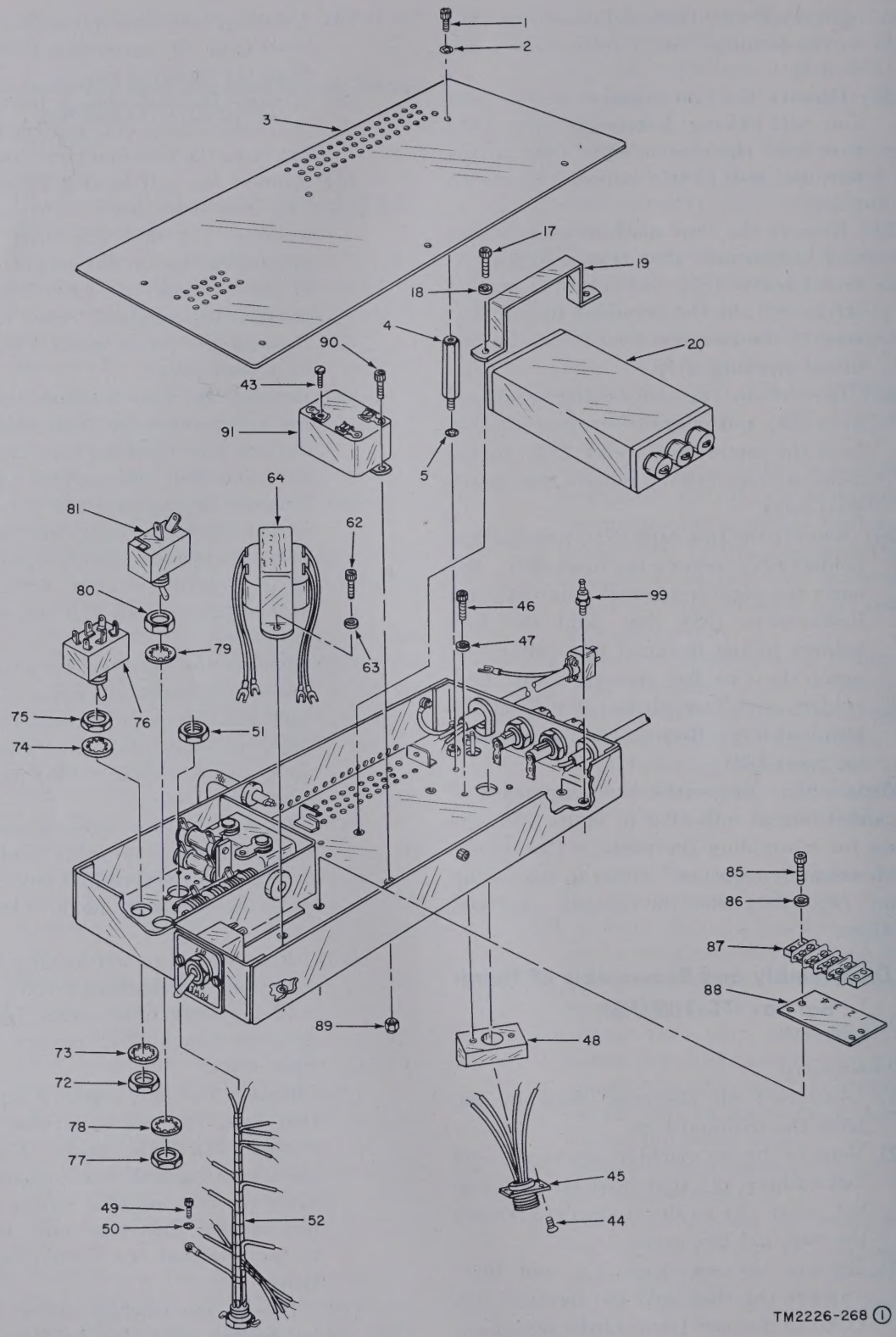
(10) Remove the machine screw (28), lockwasher (29), and nut plate (30), catching the flat washer (31), centering washer (32), resistor (33), centering washer (34), and flat washer (35) as they fall free.

(11) Remove the two machine screws (36) and lockwashers (37) that hold the rectifier (38) to the terminal box (106); remove the rectifier. Remove the resistor (39).

(12) Remove the two self-locking hexagonal nuts (40) and machine screws (41) that hold the copy light socket (42) to the terminal box (106); remove the copy light socket.

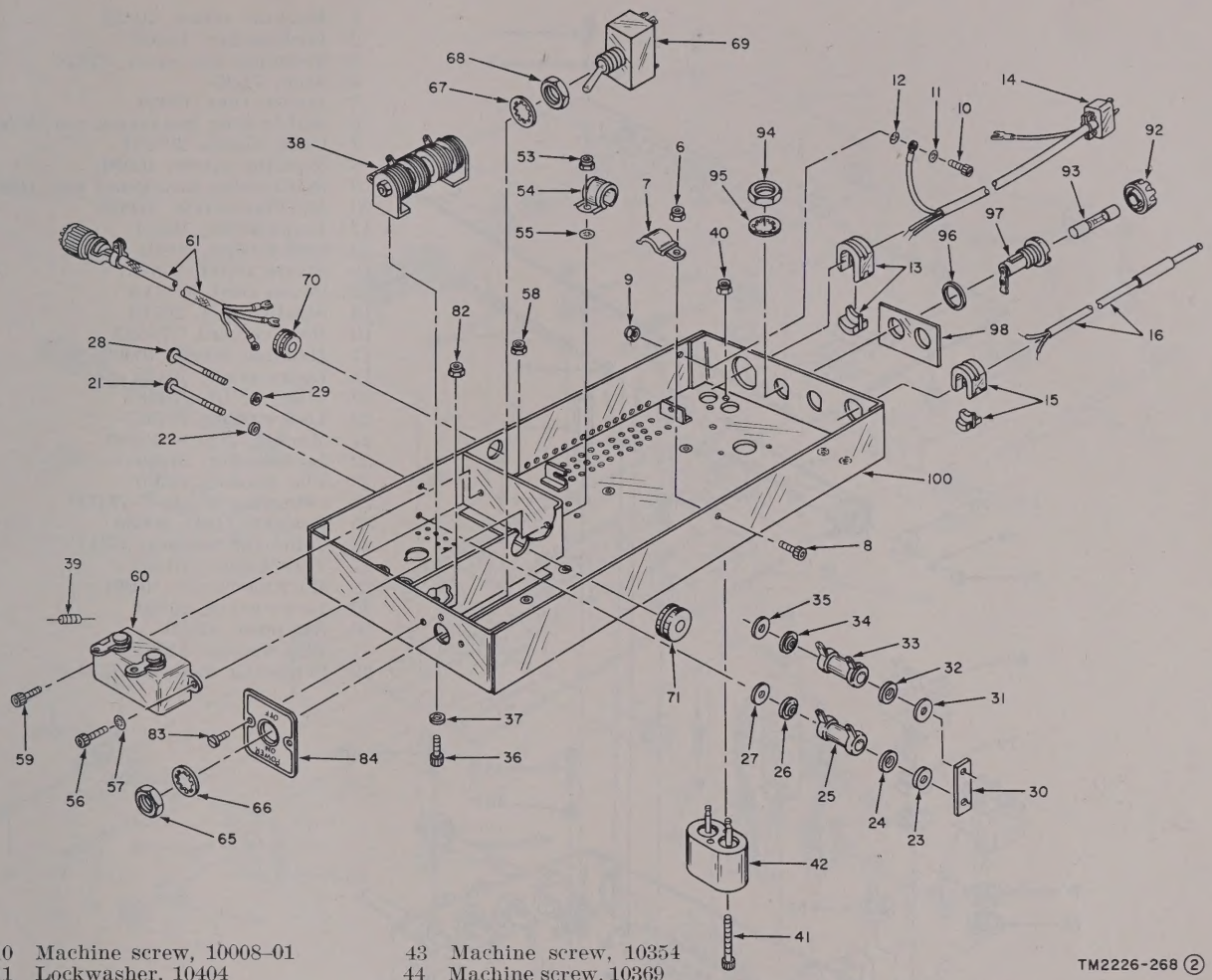
(13) Remove the four machine screws (43) that hold the motor harness cable assembly (44) to the spacer (47); remove the motor harness cable assembly. Remove the two machine screws (45) and lockwashers (46) that hold the spacer to the terminal box (106); remove the spacer.

(14) Remove the machine screw (48) and lockwasher (49) that hold the grounding lug on the cable assembly (51) to the terminal box (106). Remove the plain



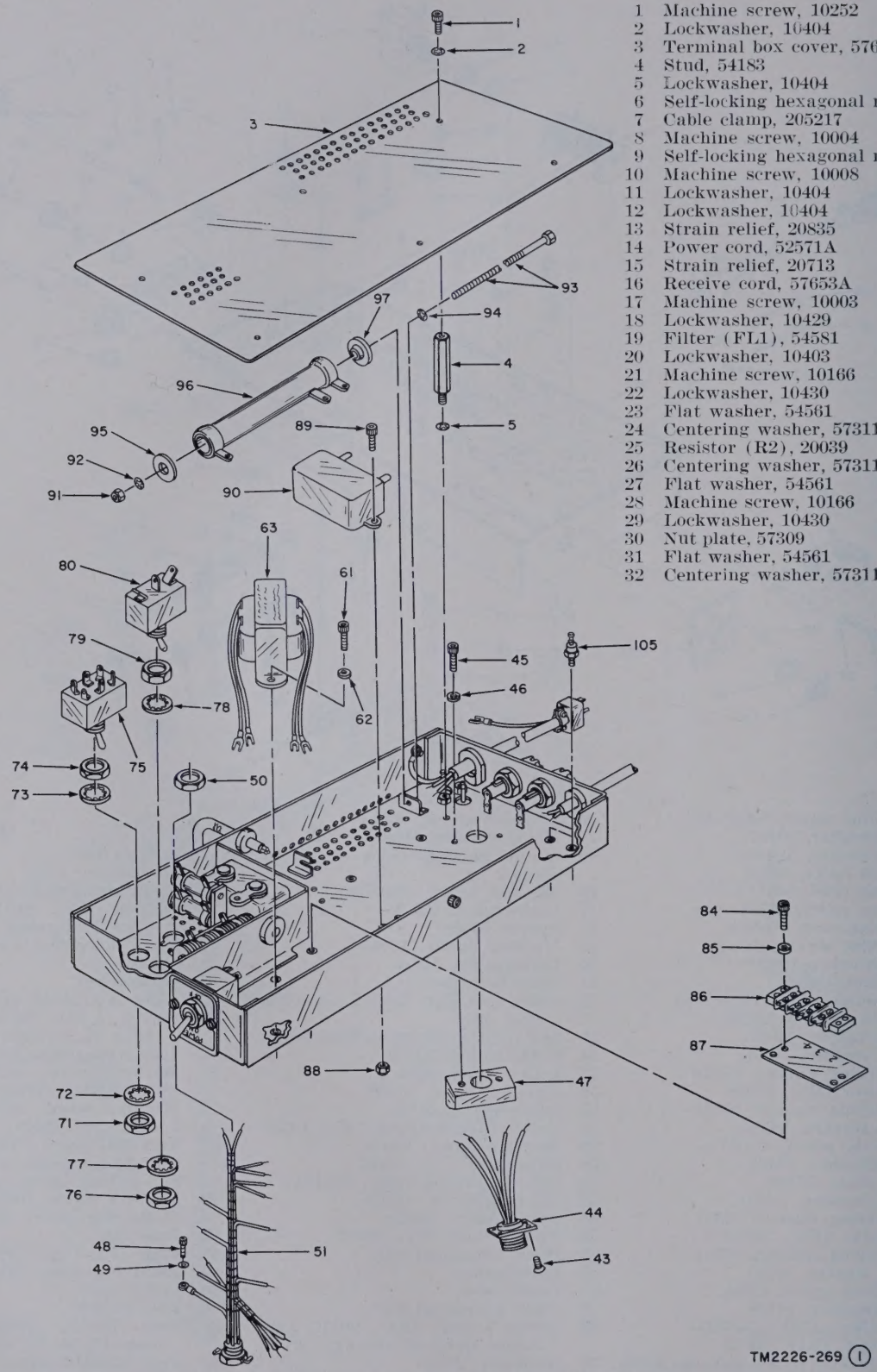
1 Machine screw, 10252
2 Lockwasher, 10404
3 Terminal box cover, 57638
4 Stud, 54183
5 Lockwasher, 10404
6 Self-locking hexagonal nut, 10500
7 Cable clamp, 20517
8 Machine screw, 10004
9 Self-locking hexagonal nut, 10501

Figure 168. Terminal box, exploded view (TT–107B/FG).



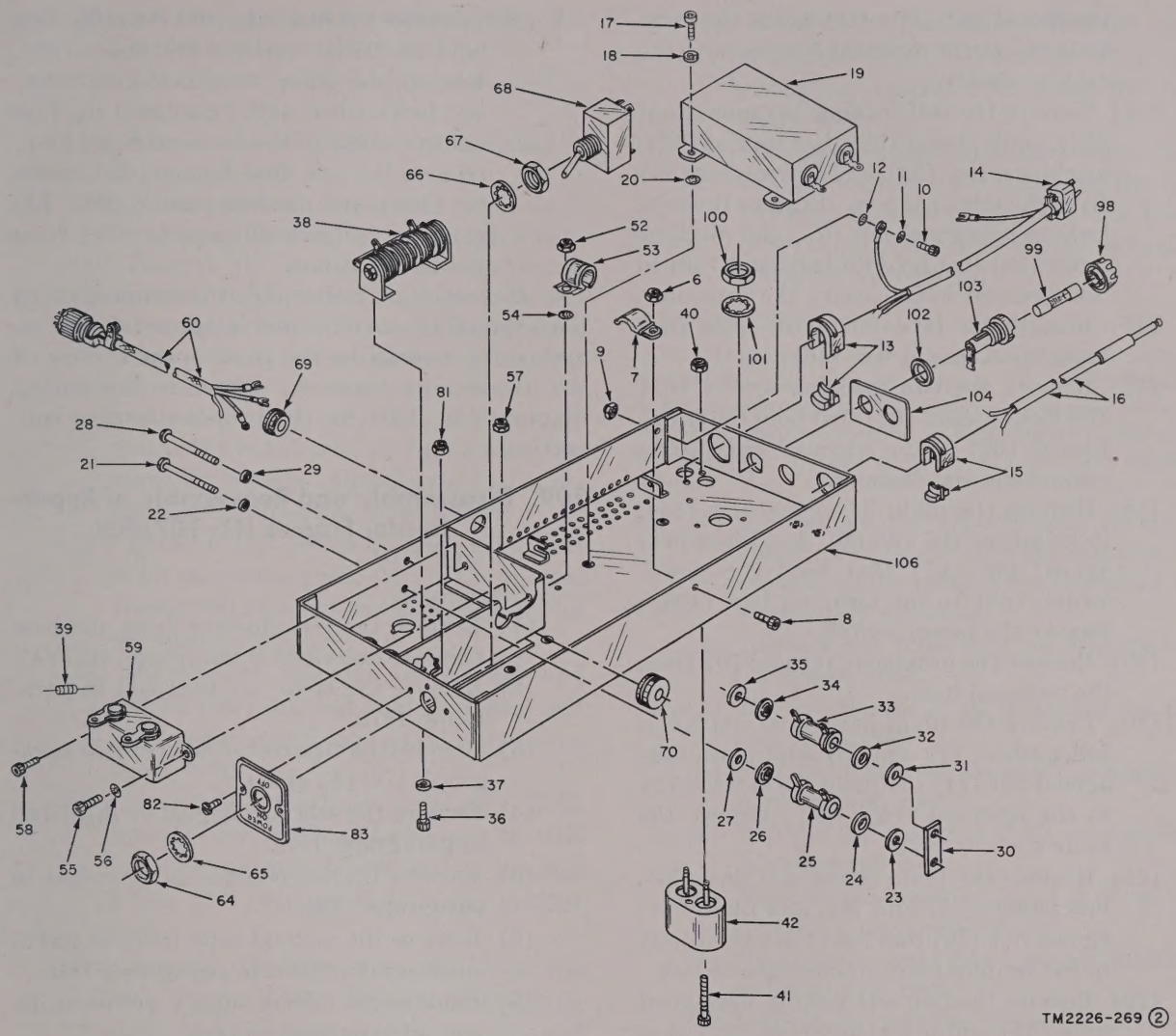
10 Machine screw, 10008–01
11 Lockwasher, 10404
12 Lockwasher, 10404
13 Strain relief, 20835
14 Power cord, 52571A
15 Strain relief, 20713
16 Receive cord, 57653A
17 Machine screw, 10003
18 Lockwasher, 10429
19 Bracket, 54206
20 Capacitor (C2), 53344
21 Machine screw, 10166
22 Lockwasher, 10430
23 Flat washer, 54561
24 Centering washer, 57311
25 Resistor (R2), 20039
26 Centering washer, 57311
27 Flat washer, 54561
28 Machine screw, 10166
29 Lockwasher, 10430
30 Nut plate, 57309
31 Flat washer, 54561
32 Centering washer, 57311
33 Resistor (R3), 20040
34 Centering washer, 57311
35 Flat washer, 54561
36 Machine screw, 10001
37 Lockwasher, 10429
38 Rectifier (CR1), 54356A
39 Resistor (R1), 20010
40 Self-locking hexagonal nut, 10501
41 Machine screw, 10013
42 Copy light socket, 53320A
43 Machine screw, 10354
44 Machine screw, 10369
45 Motor harness cable assembly, 57644A
46 Machine screw, 10106
47 Lockwasher, 10429
48 Spacer, 57658
49 Machine screw, 10055
50 Lockwasher, 10403
51 Plain hexagonal nut
52 Cable assembly, 57648A (includes item 50)
53 Self-locking hexagonal nut, 10500
54 Cable clamp, 20519
55 Lockwasher, 10403
56 Machine screw, 11500
57 Lockwasher, 10403
58 Self-locking hexagonal nut, 10500
59 Machine screw, 10003
60 Capacitor (C1), 20213
61 Tape-out alarm cable, 57643A
62 Machine screw, 10003
63 Lockwasher, 10429
64 Transformer (T1), 53667
65 Plain hexagonal nut
66 Lockwasher
67 Lockwasher
68 Plain hexagonal nut
69 Power switch (S4), 20115 (includes items 65 through 68)
70 Grommet, 20726
71 Grommet, 21000
72 Plain hexagonal nut
73 Lockwasher
74 Lockwasher
75 Plain hexagonal nut
76 Switch (S1), 20121 (includes items 72 through 75)
77 Plain hexagonal nut
78 Lockwasher
79 Lockwasher
80 Plain hexagonal nut
81 Switch (S2), 20127 (includes items 77 through 80)
82 Self-locking hexagonal nut, 10540
83 Machine screw, 10335
84 Switch plate, 57651
85 Machine screw, 10006
86 Lockwasher, 10429
87 Terminal board (TB1), 20368
88 Terminal marker strip, 20388
89 Self-locking hexagonal nut, 10500
90 Machine screw, 10003
91 Motor start relay (K1), 20120
92 Fuse cap
93 Fuse (F1, F2), 20468
94 Plain hexagonal nut
95 Lockwasher
96 Flat washer
97 Fuse holder, 20458 (includes items 92, 94, 95, and 96)
98 Fuse plate, 57652
99 Grounding post, 20357
100 Terminal box, 57635A

Figure 168—Continued



1 Machine screw, 10252
2 Lockwasher, 10404
3 Terminal box cover, 57638
4 Stud, 54183
5 Lockwasher, 10404
6 Self-locking hexagonal nut, 10500
7 Cable clamp, 205217
8 Machine screw, 10004
9 Self-locking hexagonal nut, 10501
10 Machine screw, 10008
11 Lockwasher, 10404
12 Lockwasher, 10404
13 Strain relief, 20835
14 Power cord, 52571A
15 Strain relief, 20713
16 Receive cord, 57653A
17 Machine screw, 10003
18 Lockwasher, 10429
19 Filter (FL1), 54581
20 Lockwasher, 10403
21 Machine screw, 10166
22 Lockwasher, 10430
23 Flat washer, 54561
24 Centering washer, 57311
25 Resistor (R2), 20039
26 Centering washer, 57311
27 Flat washer, 54561
28 Machine screw, 10166
29 Lockwasher, 10430
30 Nut plate, 57309
31 Flat washer, 54561
32 Centering washer, 57311

Figure 169. Terminal box, exploded view (TT–109/FG).



33 Resistor (R3), 20040
34 Centering washer, 57311
35 Flat washer, 54561
36 Machine screw, 10001
37 Lockwasher, 10429
38 Rectifier (CR1), 54356A
39 Resistor (R1), 20010
40 Self-locking hexagonal nut, 10501
41 Machine screw, 10013
42 Copy light socket, 53320A
43 Machine screw, 10367
44 Motor harness cable assembly, 57649A
45 Machine screw, 10106
46 Lockwasher, 10429
47 Spacer, 57658
48 Machine screw, 10055
49 Lockwasher, 10403
50 Plain hexagonal nut
51 Cable assembly, 57648A (includes item 50)
52 Self-locking hexagonal nut, 10500
53 Cable clamp, 20519
54 Lockwasher, 10403
55 Machine screw, 11500
56 Lockwasher, 10403
57 Self-locking hexagonal nut, 10500
58 Machine screw, 10003
59 Capacitor (C1), 20213
60 Tape out alarm cable, 57643A
61 Machine screw, 10003
62 Lockwasher, 10429
63 Transformer (T1), 53667
64 Plain hexagonal nut
65 Lockwasher
66 Lockwasher
67 Plain hexagonal nut
68 Power switch (S4), 20115 (includes items 64 through 67)
69 Grommet, 20726
70 Grommet, 21000
71 Plain hexagonal nut
72 Lockwasher
73 Lockwasher
74 Plain hexagonal nut
75 Switch (S1), 20121 (includes items 71 through 74)
76 Plain hexagonal nut
77 Lockwasher
78 Lockwasher
79 Plain hexagonal nut
80 Switch (S2), 20127 (includes items 76 through 79)
81 Self-locking hexagonal nut, 10540
82 Machine screw, 10335
83 Switch plate, 57651
84 Machine screw, 10006
85 Lockwasher, 10429
86 Terminal board (TB1), 20368
87 Terminal marker strip, 20388
88 Self-locking hexagonal nut, 10500
89 Machine screw, 10003
90 Capacitor (C3), 20214
91 Plain hexagonal nut
92 Lockwasher, 10404
93 Machine screw, 56220A
94 Lockwasher, 10404
95 Centering washer, 10456
96 Resistor (R5), 51628
97 Centering washer, 10456
98 Fuse cap
99 Fuse (F1, F2), 20455
100 Plain hexagonal nut
101 Lockwasher
102 Flat washer
103 Fuse holder, 20458
104 Fuse plate, 54208
105 Grounding post, 20357
106 Terminal box, 57635A

Figure 169—Continued

hexagonal nut (50) that holds the cable assembly to the terminal box; remove the cable assembly.

(15) Remove the self-locking hexagonal nut (52), cable clamp (53), lockwasher (54), machine screw (55), and lockwasher (56) from the terminal box. Remove the self-locking hexagonal nut (57) and machine screw (58) that hold the capacitor (59) to the terminal box; remove the capacitor.

(16) Remove the tape-out alarm cable (60) from the terminal box (106).

(17) Remove the two machine screws (61) and lockwashers (62) that hold the transformer (63) to the terminal box (106); remove the transformer.

(18) Remove the plain hexagonal nut (64), lockwashers (65 and 66), and plain hexagonal nut (67) that hold the power switch (68) to the terminal box (106); remove the power switch.

(19) Remove the grommets (69 and 70) from the terminal box.

(20) Remove the plain hexagonal nut (71), lockwashers (72 and 73), and plain hexagonal nut (74) that hold the switch (75) to the terminal box (106); remove the switch.

(21) Remove the plain hexagonal nut (76), lockwashers (77 and 78), and plain hexagonal nut (79) that hold the switch (80) to the terminal box; remove the switch.

(22) Remove the two self-locking hexagonal nuts (81) and machine screws (82) that hold the switch plate (83) to the terminal box (106); remove the switch plate.

(23) Remove the four machine screws (84) and lockwashers (85) that hold the terminal board (86) and terminal marker strip (87) to the terminal box; remove the terminal board and terminal marker strip.

(24) Remove the two self-locking hexagonal nuts (88) and machine screws (89) that hold the capacitor (90) to the terminal box (106); remove the capacitor.

(25) Remove the plain hexagonal nut (91), lockwasher (92), machine screw (93), and lockwasher (94) that hold the resistor (96) to the terminal box (106); remove the resistor and centering washers (95 and 97).

(26) Remove the fuse caps (98) from the fuse holders (103); remove the fuses (99). Remove the plain hexagonal nuts (100) and lockwashers (101) that hold the fuse holders (103) to the terminal box (106); remove the two fuse holders, flat washers (102), and the fuse plate (104). Remove the two grounding posts (105) from the terminal box.

b. Reassembly. Reassemble the components of the terminal box as indicated in figure 169; the sequence for assembling the parts is the reverse of the disassembly sequence. Refer to the wiring diagram (fig. 130) for the proper electrical connections.

209. Disassembly and Reassembly of Reperforator Frames (TT–107/FG)

(fig. 170)

a. Disassembly.

(1) Remove the reperforator from the base frame as described in paragraph 165*b*(4).

(2) Remove the motor as described in paragraph 167*a*.

(3) Remove the tape reel as described in paragraph 174*a*(1) and (2).

(4) Remove the selector magnet as described in paragraph 177*a*.

(5) Remove the rangefinder as described in paragraph 179*a*.

(6) Remove the manual tape feed-out mechanism as described in paragraph 181*a*.

(7) Remove the ribbon supply group as described in paragraph 182*a*.

(8) Remove the chad tube and chad box as described in paragraph 186*a*.

(9) Remove the front support frame as described in paragraph 187*a*.

(10) Remove the Y-levers and selector levers as described in paragraph 194*a*.

(11) Remove the type wheel reciprocating mechanism as described in paragraph 196*a*.

(12) Remove the function sensing mechanism as described in paragraph 197*a*.

(13) Remove the code-ring cage as described in paragraph 198*a*.

(14) Remove the transfer lever shaft as described in paragraph 200*a*.

(15) Remove the function shaft as described in paragraph 201*a*.

(16) Remove the selector camshaft as described in paragraph 203*a*.
(17) Remove the main shaft as described in paragraph 204*a*.
(18) Remove the terminal box as described in paragraph 206*a*.
(19) If the alternate drive gear set is used, remove as described in paragraph 168.
(20) Remove the machine screw (14) and lockwasher (15) that hold the tape reel mounting bracket (16) to the base frame; remove the tape reel mounting bracket.
(21) Remove the two machine screws (17) and lockwashers (18) that hold the detents (19) to the selector frame (39); remove the detents. Remove the two selector magnet adjusting screws (20).
(22) Remove the retainer ring (21) that holds the spring guide (22) to the selector frame (39); remove the spring guide and the spring (23).
(23) Remove the machine screw (24) and lockwasher (25) that hold the signal bell (26) to the rear frame (35); remove the signal bell.
(24) Remove the machine screw (27), lockwasher (28), and two taper pins (29) that hold the bearing bracket (30) to the rear frame (35); remove the bearing bracket (30).
(25) Remove the taper pin (33) from the rear frame (35). Remove the spring posts and the bearings (34, 36, 37, and 38) if any of these parts need to be repaired or replaced.
(26) Remove the three machine screws (31) and lockwashers (32) that hold the selector frame (39) and rear frame (35) together; separate the two frames.
(27) Remove the plain hexagonal nut (40), lockwasher (41), bracket (42), machine screw (43), flat washer (44), and shock mount (45) from the base frame (58).
(28) Remove the six machine screws (46) that hold the three shock mounts (47) to the base frame (58); remove the three shock mounts.
(29) Remove the two drive screws (48) that hold the switch plate (49) to the base frame (58); remove the switch plate.
(30) Remove the four machine screws (50), grommets (51), lockwashers (52), and grounding straps (53) from the base frame (58).
(31) Remove the eight machine screws (54) and lockwashers (55) that hold the four vibration mounts (56) to the base frame (58); remove the four vibration mounts and eight spacers (57).

b. Reassembly.

Note. If any of the spring posts, pins, or studs are loose or damaged, they must be replaced. To prevent damage to the frame, support the frame near the post to be removed. Press new posts in at right angles to the plane of the frame. Replace a frame that has worn threads, enlarged holes, or is otherwise damaged.

(1) Reassemble the reperforator frame as indicated in figure 170; the sequence for assembling the parts is the reverse of the disassembly sequence.
(2) Replace the filter unit as described in paragraph 206*b*.
(3) Replace the main shaft as described in paragraph 204*b*.
(4) Replace the selector camshaft as described in paragraph 203*b*.
(5) Replace the function shaft as described in paragraph 201*b*.
(6) Replace the transfer lever shaft as described in paragraph 200*b*.
(7) Replace the code-ring cage as described in paragraph 198*b*.
(8) Replace the function sensing mechanism as described in paragraph 197*b*.
(9) Replace the type wheel reciprocating mechanism as described in paragraph 196*b*.
(10) Replace the Y-lever and selector levers as described in paragraph 194*b*.
(11) Replace the front support frame as described in paragraph 187*b*.
(12) Replace the ribbon supply group as described in paragraph 182*b*.
(13) Replace the manual tape feed-out mechanism as described in paragraph 181*b*.
(14) Replace the rangefinder as described in paragraph 179*b*.
(15) Replace the selector magnet as described in paragraph 177*b*.
(16) Replace the tape reel as described in paragraph 174*b*.

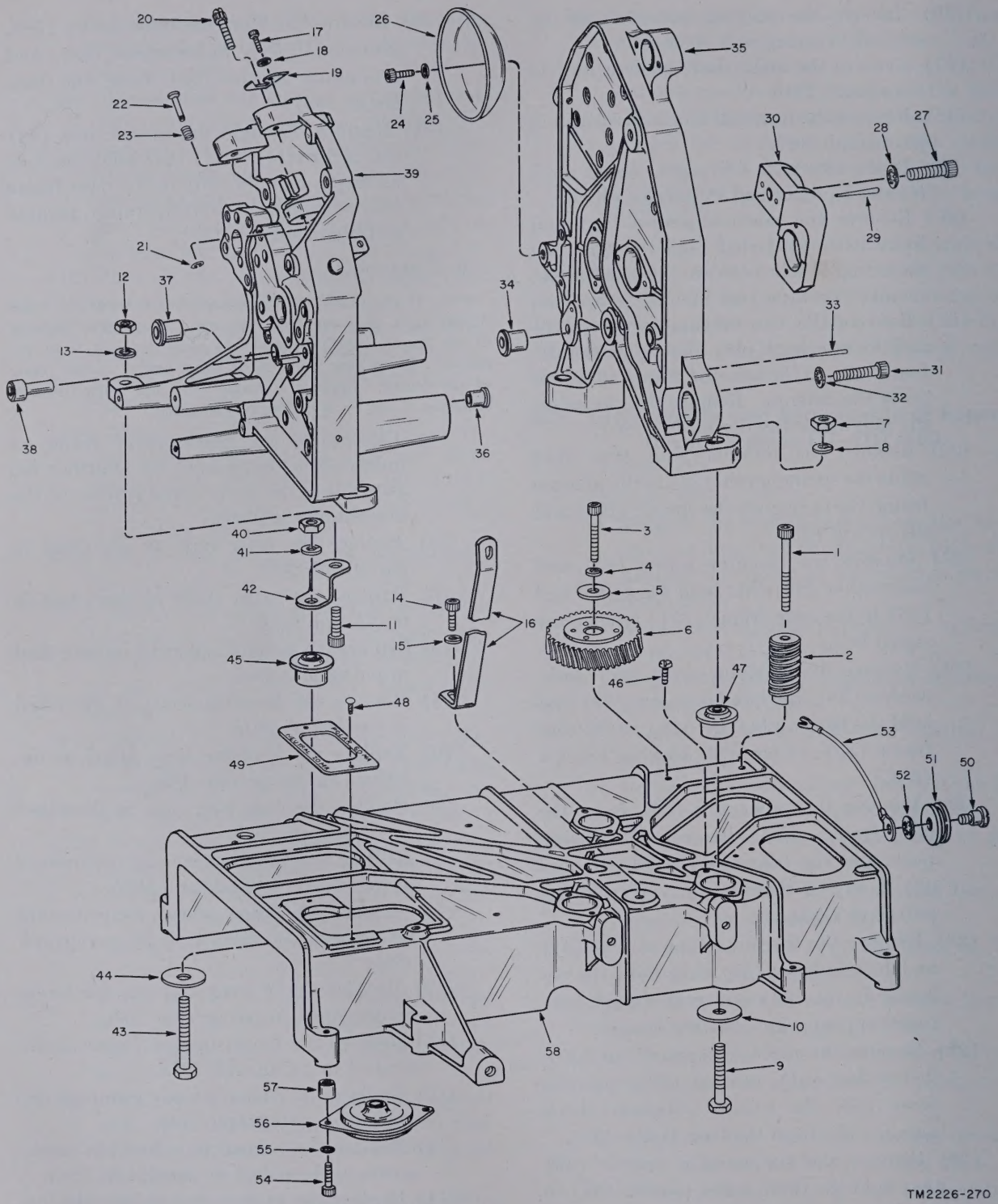


Figure 170. Reperforator frames, exploded view (TT–107/FG).

(17) Replace the motor as described in paragraph 167*b*.

(18) Replace the reperforator on the base frame by reversing the sequence of disassembly outlined in paragraph 165*b*(4).

210. Disassembly and Reassembly of Reperforator Frames (TT–107B/FG)

(fig. 171)

a. Disassembly.

(1) Remove the reperforator from the base frame as described in paragraph 165*b*(4).

(2) Remove the motor as described in paragraph 167*a*.

(3) Remove the tape reel as described in paragraph 175*a*.

(4) Remove the tape puller mechanism as described in paragraph 176*a*(1).

(5) Remove the selector magnet as described in paragraph 178*a*.

(6) Remove the rangefinder as described in paragraph 180*a*.

(7) Remove the manual tape feed-out mechanism as described in paragraph 181*a*.

(8) Remove the ribbon supply group as described in paragraph 183*a*.

(9) Remove the chad tube and chad box as described in paragraph 186*a*.

(10) Remove the front support frame as described in paragraph 188*a*.

(11) Remove the Y-levers and selector levers as described in paragraph 195*a*.

(12) Remove the type wheel reciprocating mechanism as described in paragraph 196*a*.

(13) Remove the function sensing mechanism as described in paragraph 197*a*.

(14) Remove the code-ring cage as described in paragraph 198*a*.

(15) Remove the transfer lever shaft as described in paragraph 200*a*.

(16) Remove the function shaft as described in paragraph 202*a*.

(17) Remove the selector camshaft as described in paragraph 203*a*.

(18) Remove the main shaft as described in paragraph 205*a*.

(19) Remove the terminal box as described in paragraph 207*a* or 208*a*.

(20) If the alternate drive gear set is used, remove as described in paragraph 168.

(21) Remove the machine screw (11) and lockwasher (12) that hold the tape reel mounting bracket (13) to the base frame; remove the tape reel mounting bracket.

(22) Remove the two machine screws (14) and lockwashers (15) that hold the detents (16) to the selector frame (44); remove the detents. Remove the selector magnet adjusting screws (17).

(23) Remove the machine screw (18) and lockwasher (19) that hold the signal bell (20) to the rear frame (32); remove the signal bell.

(24) Remove the machine screw (21), lockwasher (22), and taper pins (23) that hold the bearing bracket (24) to the rear frame (32); remove the bearing bracket.

(25) Remove the two machine screws (25) and lockwashers (26) from the rear frame (32).

---

1 Machine screw, 10013
2 Worm gear (600 opm), 50596
3 Machine screw, 10014
4 Lockwasher, 10430
5 Flat washer, 50381
6 Main shaft driven gear (600 opm), 50597A
7 Self-locking hexagonal nut, 10509
8 Lockwasher, 10431
9 Machine screw, 10078
10 Flat washer, 10474
11 Machine screw, 10029
12 Plain hexagonal nut, 10509
13 Lockwasher, 10431
14 Machine screw, 10015
15 Lockwasher, 10525
16 Tape reel mounting bracket, 54202
17 Machine screw, 10004
18 Lockwasher, 10429
19 Detent, 52687
20 Selector magnet adjusting screw, 52688
21 Retainer ring, 10981
22 Spring guide, 53099
23 Spring, 52188
24 Machine screw, 10008
25 Lockwasher, 10430
26 Signal bell, 51080
27 Machine screw, 10021–01
28 Lockwasher, 10400
29 Taper pin, 10860
30 Bearing bracket, 52341
31 Machine screw, 10035–01
32 Lockwasher, 10405
33 Taper pin, 10859
34 Bearing, 10708
35 Rear frame, 54171
36 Bearing, 10716
37 Bearing, 10708
38 Bearing, 52137
39 Selector frame, 52497
40 Plain hexagonal nut, 10509
41 Lockwasher, 10431
42 Bracket, 54179
43 Machine screw, 10079
44 Flat washer, 10474
45 Shock mount, 54189
46 Machine screw, 53336
47 Shock mount, 54189
48 Drive screw, 10336
49 Switch plate, 54178
50 Machine screw, 52701
51 Grommet, 52254
52 Lockwasher, 10405
53 Grounding strap, 53907A
54 Machine screw, 10010
55 Lockwasher, 10404
56 Vibration mount, 10915
57 Spacer, 54177
58 Base frame, 54188

Figure 170—Continued

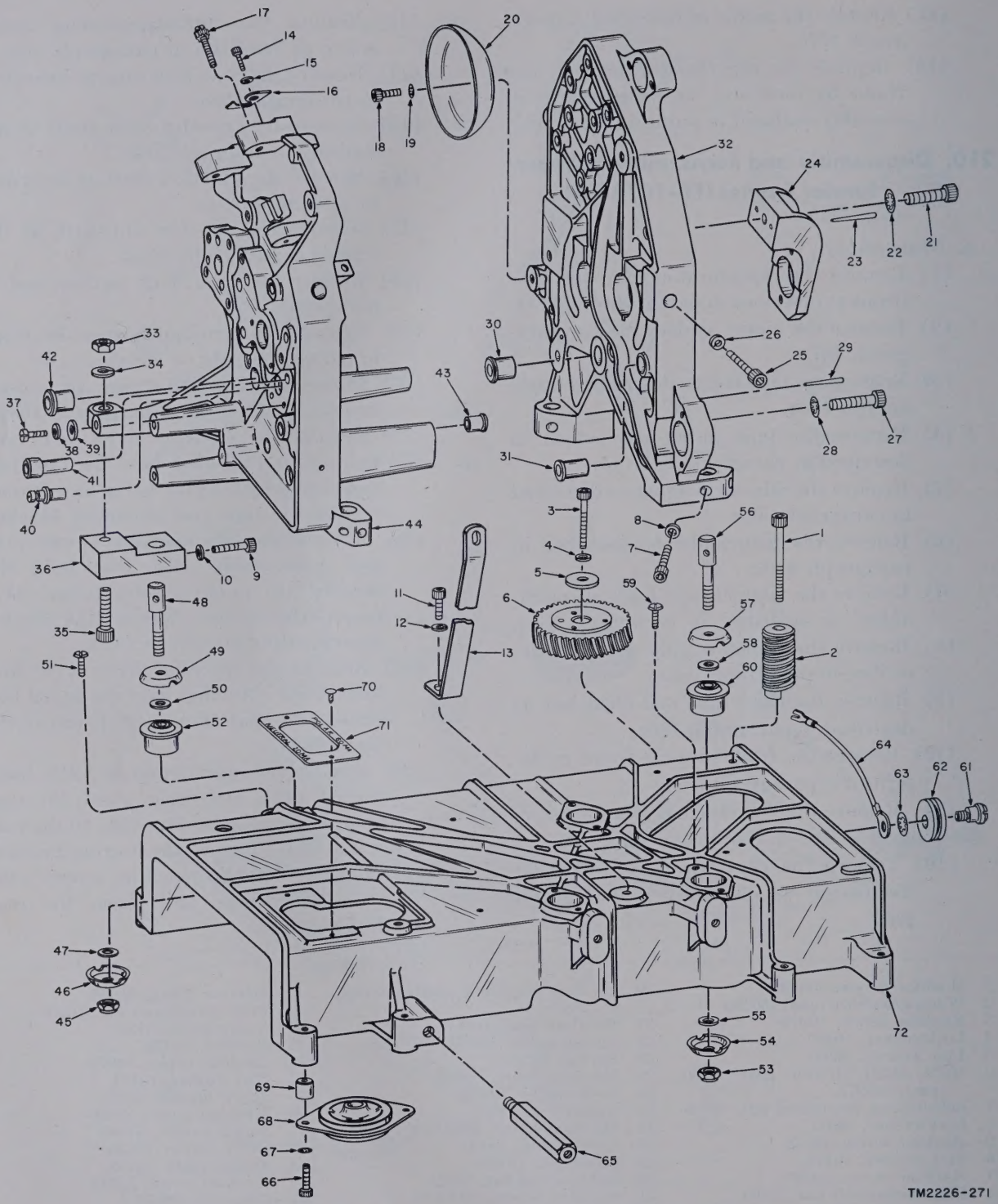


Figure 171. Reperforator frames, exploded view (TT–107B/FG).

(26) Remove the three machine screws (27) and lockwashers (28) that hold the rear frame (32) to the selector frame (44); separate the two frames.

(27) Remove the taper pins (29) and bearings (30 and 31) from the rear frame (32).

(28) Remove the self-locking hexagonal nut (33), lockwasher (34), and machine screw (35) that hold the spacer (36) to the selector frame (44); remove the spacer.

(29) Remove the machine screw (37), lockwasher (38), flat washer (39), eccentric (40), and bearings (41, 42, and 43) from the selector frame (44).

(30) Remove the self-locking hexagonal nut (45), spacer (46), flat washer (47), stud (48), spacer (49), and flat washer (50) from the shock mount (52). Remove the two machine screws (51) that hold the shock mount to the base frame (72); remove the shock mount.

(31) Remove the three self-locking hexagonal nuts (53), spacers (54), flat washers (55), studs (56), spacers (57), and flat washers (58) from the shock mounts (60). Remove the six machine screws (59) that hold the three shock mounts to the base frame (72); remove the shock mounts.

(32) Remove the four machine screws (61), grommets (62), lockwashers (63), and grounding straps (64) from the base frame (72).

(33) Remove the stud (65) from the base frame (72). Remove the eight machine screws (66) and lockwashers (67) that hold the four vibration mounts (68) to the base frame; remove the four vibration mounts and eight spacers.

(34) Remove the two drive screws (70) that hold the switch plate (71) to the base frame (72); remove the switch plate.

b. Reassembly.

Note. If any of the spring posts, pins, or studs are loose or damaged, they must be replaced. To prevent damage to the frame, support the frame near the post to be removed. Press new posts in at right angles to the plane of the frame. Replace a frame that has worn threads, enlarged holes, or is otherwise damaged.

(1) Reassemble the reperforator frame as indicated in figure 171; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the terminal box as described in paragraph 207*b* or 208*b*.

(3) Replace the main shaft as described in paragraph 205*b*.

(4) Replace the selector camshaft as described in paragraph 203*b*.

(5) Replace the function shaft as described in paragraph 202*b*.

(6) Replace the transfer lever shaft as described in paragraph 200*b*.

---

1 Machine screw, 10013
2 Worm gear (600 opm), 50596
3 Machine screw, 10014
4 Lockwasher, 10430
5 Flat washer, 50887
6 Main driven gear (600 opm), 50597A
7 Machine screw, 10037
8 Lockwasher, 10430
9 Machine screw, 10037
10 Lockwasher, 10430
11 Machine screw, 10015
12 Lockwasher, 10525
13 Tape reel mounting bracket, 54202
14 Machine screw, 10004
15 Lockwasher, 10429
16 Detent, 52687
17 Selector magnet adjusting screw, 52688
18 Machine screw, 10008
19 Lockwasher, 10430
20 Signal bell, 51080
21 Machine screw, 10021–01
22 Lockwasher, 10400
23 Taper pin, 10860
24 Bearing bracket, 56190
25 Machine screw, 10013
26 Lockwasher, 10430
27 Machine screw, 10035–01
28 Lockwasher, 10405
29 Taper pin, 10859
30 Bearing, 10708
31 Bearing, 10716
32 Rear frame, 57411
33 Plain hexagonal nut, 10509
34 Lockwasher, 10431
35 Machine screw, 10029
36 Spacer, 57413
37 Machine screw, 55511
38 Lockwasher, 10429
39 Flat washer, 50839
40 Eccentric, 56076
41 Bearing, 52137
42 Bearing, 10708
43 Bearing, 10716
44 Selector frame, 57415A
45 Self-locking hexagonal nut, 10525
46 Spacer, 57407
47 Flat washer, 10481
48 Stud, 57406
49 Spacer, 57407
50 Flat washer, 10481
51 Machine screw, 53336
52 Shock mount, 54189
53 Self-locking hexagonal nut, 10525
54 Spacer, 57407
55 Flat washer, 10481
56 Stud, 57406
57 Spacer, 57407
58 Flat washer, 56545
59 Machine screw, 53336
60 Shock mount, 54189
61 Machine screw, 52701
62 Grommet, 52254
63 Lockwasher, 10405
64 Grounding strap, 53907A
65 Stud, 57408
66 Machine screw, 10010
67 Lockwasher, 10404
68 Vibration mount, 10915
69 Spacer, 54177
70 Drive screw, 10336
71 Switch plate, 54178
72 Base frame, 57612A

Figure 171—Continued

(7) Replace the code-ring cage as described in paragraph 198*b*.
(8) Replace the function sensing mechanism as described in paragraph 197*b*.
(9) Replace the type wheel reciprocating mechanism as described in paragraph 196*b*.
(10) Replace the Y-levers and selector levers as described in paragraph 195*b*.
(11) Replace the front support frame as described in paragraph 188*b*.
(12) Replace the chad tube and chad box as described in paragraph 186*b*.
(13) Replace the ribbon supply group as described in paragraph 183*b*.
(14) Replace the manual tape feed-out mechanism as described in paragraph 181*b*.
(15) Replace the rangefinder as described in paragraph 180*b*.
(16) Replace the tape puller mechanism as described in paragraph 176*b*.
(17) Replace the selector magnet as described in paragraph 178*b*.
(18) Replace the tape reel as described in paragraph 175*b*.
(19) Replace the motor as described in paragraph 167*b*.
(20) Replace the reperforator on the base frame by reversing the procedures outlined in paragraph 165*b*(4).

211. Disassembly and Reassembly of Dust Cover (TT–107/FG)

(fig. 172)

a. Disassembly.

(1) Remove the dust cover from the reperforator as described in paragraph 12*c*.
(2) Remove the copy lamp (1) from the copy lamp holder on the dust cover. Unsolder and disconnect the copy light cable assembly (19) from the lamp holder.
(3) Remove the two plain hexagonal nuts (2) and lockwashers (3) that hold the terminal lugs (4) to the terminal posts (8). Unsolder and uncrimp the terminal lugs from the copy light cable assembly (19).
(4) Remove the two flat washers (5), lockwashers (6), and plain hexagonal nuts (7) from the terminal posts (8); remove the terminal posts and bushings (9).
(5) Remove the machine screw (10), self-locking hexagonal nut (11), and lockwasher (12) that hold the grounding lug (13) to the bracket (17) and the bracket to the rear of the dust cover. Unsolder and uncrimp the grounding lug from the copy light cable assembly (19).
(6) Remove the machine screw (14) and self-locking hexagonal nut (15) that hold the cable clamp (16) to the bracket (17) and the bracket to the rear of the dust cover (33); remove the bracket (17) and two lockwashers (18) from the dust cover and the cable clamp from the copy light cable assembly (19).
(7) Remove the two machine screws (20), lockwashers (21), and the nut plate (22) that hold the latch plate (23) to the dust cover (33); remove the latch plate (23).
(8) Remove the latch spring (24) from the left and right latches (25 and 26); remove the left and right latches.
(9) Remove the self-tapping screw (27) that holds the clamp (28) to the dust cover (33); remove the clamp (28) from the copy light director (29). Remove the copy light director.
(10) Remove the self-locking hexagonal nut (30) and lockwasher (31) that hold the grounding post (32) to the dust cover (33); remove the grounding post.

b. Reassembly.

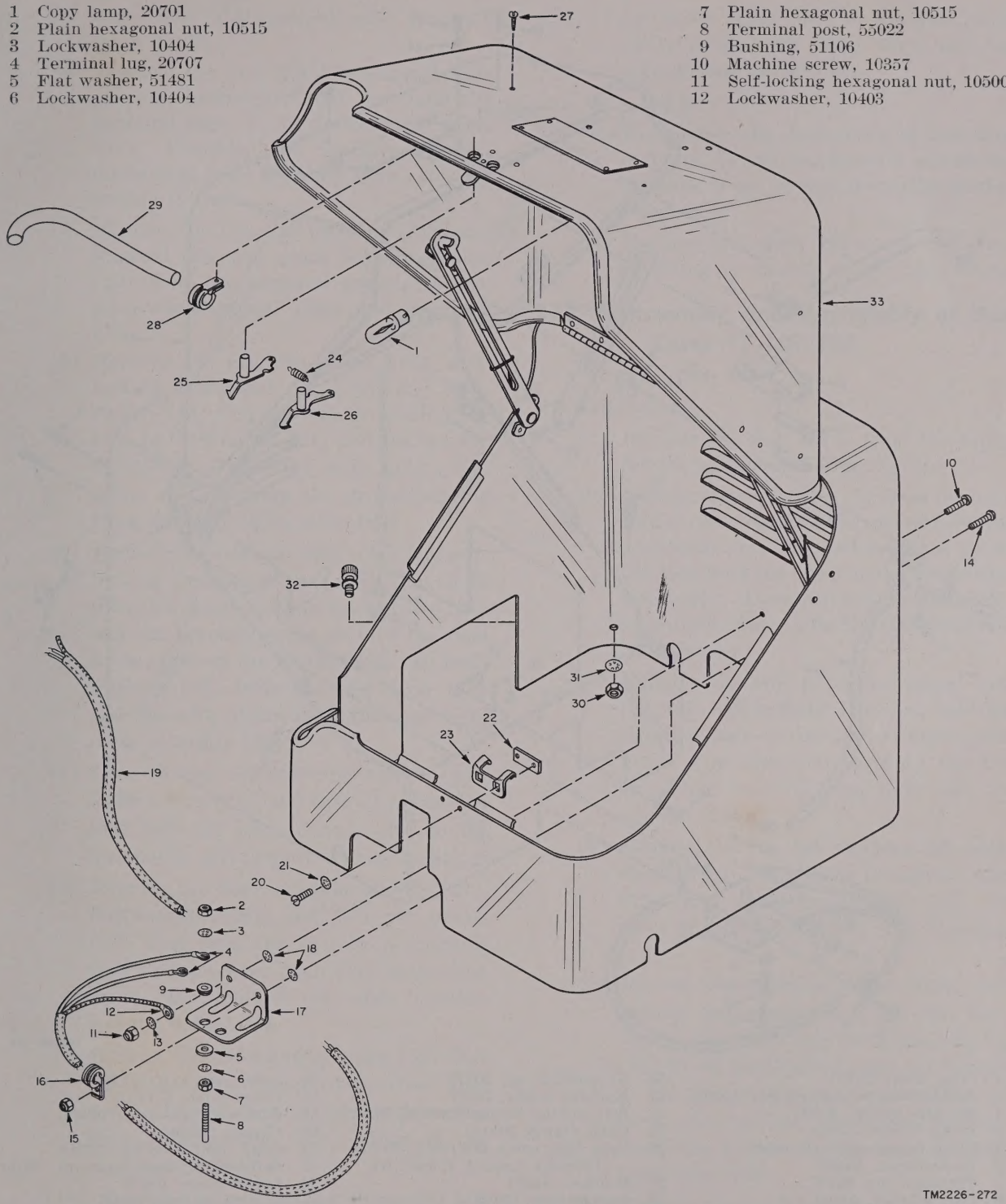
(1) Reassemble the dust cover as indicated in figure 172; the sequence for assembling the parts is the reverse of the disassembly sequence.
(2) Replace the dust cover on the four mounting grommets on the base frame.

212. Disassembly and Reassembly of Dust Cover (TT–107B/FG)

(fig. 173)

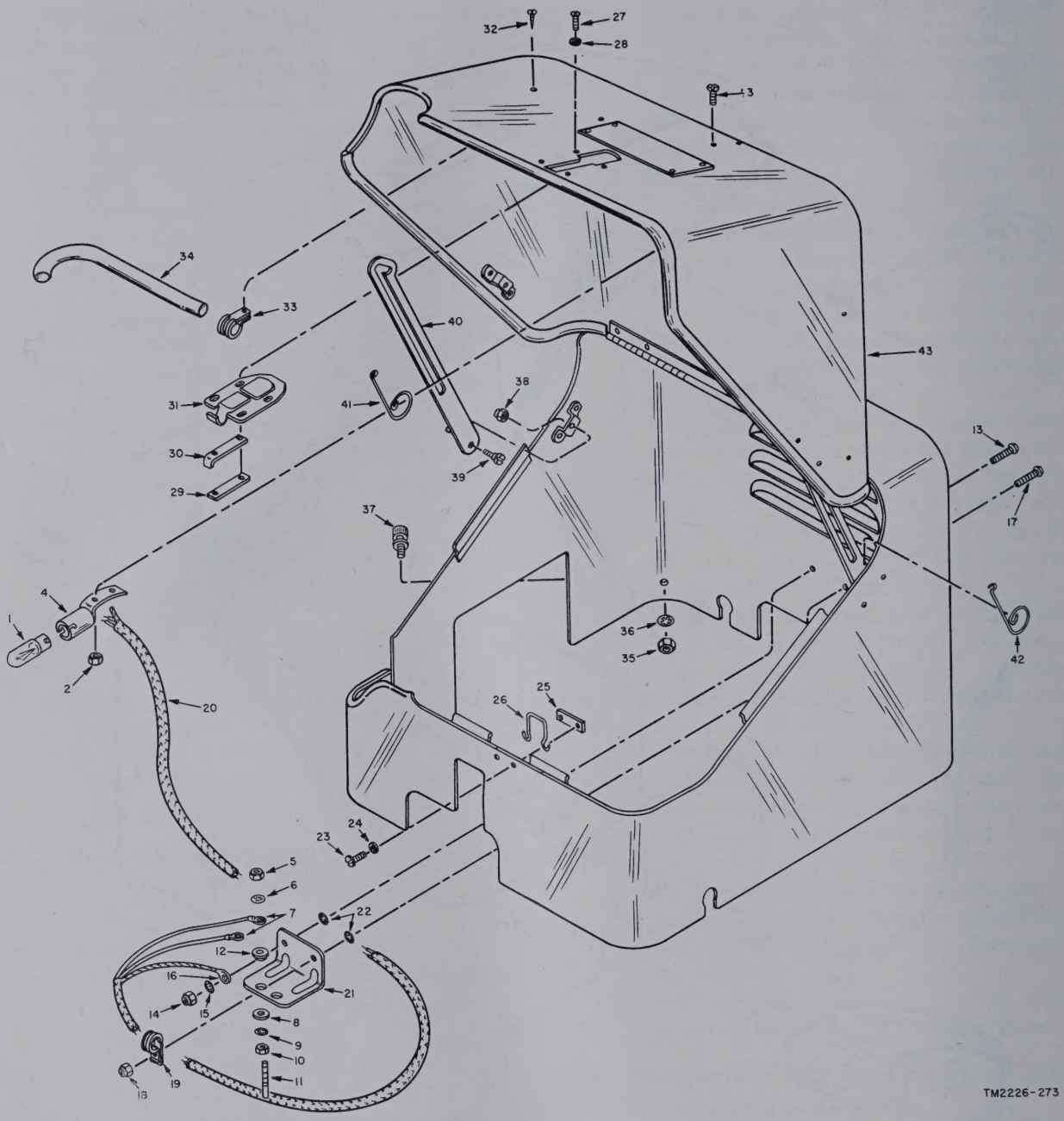
a. Disassembly.

(1) Remove the dust cover from the reperforator as described in paragraph 12*c*.
(2) Remove the copy lamp (1) from the lamp holder (4). Remove the two self-locking hexagonal nuts (2) and machine screws (3) that hold the lamp holder to the dust cover (43). Unsolder and disconnect the



1 Copy lamp, 20701
2 Plain hexagonal nut, 10515
3 Lockwasher, 10404
4 Terminal lug, 20707
5 Flat washer, 51481
6 Lockwasher, 10404
7 Plain hexagonal nut, 10515
8 Terminal post, 55022
9 Bushing, 51106
10 Machine screw, 10357
11 Self-locking hexagonal nut, 10500
12 Lockwasher, 10403
13 Grounding lug, 20379
14 Machine screw, 10357
15 Self-locking hexagonal nut, 10500
16 Cable clamp, 20515
17 Bracket, 54227
18 Lockwasher, 10403
19 Copy light cable assembly, 54226A (includes items 4 and 13)
20 Machine screw, 10357
21 Lockwasher, 10403
22 Nut plate, 52561
23 Latch plate, 52562
24 Latch spring, 53148
25 Left latch, 52301A
26 Right latch, 52302A
27 Self-tapping screw, 10379
28 Clamp, 20500
29 Copy light director, 52744
30 Self-locking hexagonal nut, 10511
31 Lockwasher, 10403
32 Grounding post, 20825
33 Dust cover, 52125A (includes items 2 through 32)

Figure 172. Dust cover, exploded view (TT-107/FG).



1 Copy lamp, 20701
2 Self-locking hexagonal nut, 10500
3 Machine screw, 10393
4 Lamp holder, 57628
5 Plain hexagonal nut, 10515
6 Lockwasher, 10404
7 Terminal lug, 20707
8 Flat washer, 51481
9 Lockwasher, 10404
10 Plain hexagonal nut, 10515
11 Terminal post, 55022
12 Bushing, 51106
13 Machine screw, 10357
14 Self-locking hexagonal nut, 10500
15 Lockwasher, 10403
16 Grounding lug, 20379
17 Machine screw, 10357
18 Self-locking hexagonal nut, 10500
19 Cable clamp, 20515
20 Copy light cable assembly, 57627A (includes items 4, 7, and 16)
21 Bracket, 54227
22 Lockwasher, 10403
23 Machine screw, 10393
24 Lockwasher, 10429
25 Nut plate, 52661
26 Latch spring, 57177
27 Machine screw, 10124
28 Lockwasher, 10435
29 Nut plate, 57179
30 Latch bracket, 57176
31 Cover latch, 57175A
32 Self-tapping screw, 10379
33 Clamp, 20500
34 Copy light director, 52744
35 Self-locking hexagonal nut, 10511
36 Lockwasher, 10403
37 Grounding Post, 20825
38 Self-locking hexagonal nut, 10500
39 Stud, 52206
40 Cover stay, 52694
41 Stay spring, 53889
42 Stay spring, 53888
43 Dust cover, 57626 (includes all items except 1, 32, 33 and 34)

Figure 173. Dust cover, exploded view (TT–107B/FG).

copy light cable assembly (20) from the lamp holder.

(3) Remove the two plain hexagonal nuts (5) and lockwashers (6) that hold the terminal lugs (7) to the terminal posts (11). Unsolder and uncrimp the terminal lugs from the copy light cable assembly (20).

(4) Remove the two flat washers (8), lockwashers (9), and plain hexagonal nuts (10) from the terminal posts (11); remove the terminal posts and bushings (12).

(5) Remove the machine screw (13), self-locking hexagonal nut (14), and lockwasher (15) that hold the grounding lug (16) to the bracket (21) and the bracket to the rear of the dust cover (43). Unsolder and uncrimp the grounding lug from the copy light cable (20).

(6) Remove the machine screw (17) and self-locking hexagonal nut (18) that hold the cable clamp (19) to the bracket (21) and the bracket to the rear of the dust cover; remove the bracket and two lockwashers (22) from the dust cover (43) and the cable clamp from the copy light cable assembly (20).

(7) Remove the two machine screws (23), lockwashers (24), and the nut plate (25) that hold the latch spring (26) to the dust cover (43); remove the latch spring.

(8) Remove the four machine screws (27), lockwashers (28), and two nut plates (29) that hold the two latch brackets (30) and the cover latch (31) to the dust cover (43); remove the latch brackets and the cover latch.

(9) Remove the self-tapping screw (32) that holds the cable clamp (33) to the dust cover (43); remove the clamp from the copy light director (34). Remove the copy light director.

(10) Remove the self-locking hexagonal nut (35) and lockwasher (36) that hold the grounding post (37) to the dust cover (43); remove the grounding post.

(11) Remove the four self-locking hexagonal nuts (38) and studs (39) that hold the two cover stays (40) to the dust cover (43); remove the cover stays and the stay springs (41 and 42).

b. Reassembly.

(1) Reassemble the dust cover as indicated in figure 173; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the dust cover on the four mounting grommets on the base frame.

213. Disassembly and Reassembly of Dust Cover (TT–109/FG)

(fig. 174)

a. Disassembly.

(1) Remove the dust cover from the reperforator as described in paragraph 12*c*.

(2) Remove the copy lamp (1) from the lamp holder (4). Remove the two self-locking hexagonal nuts (2) and machine screws (3) that hold the lamp holder to the dust cover (44). Unsolder and disconnect the copy light cable assembly (20) from the lamp holder.

(3) Remove the two plain hexagonal nuts (5) and lockwashers (6) that hold the terminal lugs (7) to the terminal posts (11). Unsolder and uncrimp the terminal lugs from the copy light cable assembly (20).

(4) Remove the two flat washers (8), lockwashers (9), and plain hexagonal nuts (10) from the terminal posts (11); remove the terminal posts and bushings (12).

(5) Remove the machine screw (13), self-locking hexagonal nut (14), and lockwasher (15) that hold the grounding lug (16) to the bracket (21) and the bracket to the rear of the dust cover (44); remove the bracket. Unsolder and uncrimp the grounding lug from the copy light cable (20).

(6) Remove the machine screw (17) and the self-locking hexagonal nut (18) that hold the cable clamp (19) to the bracket (21) and the bracket to the rear of the dust cover; remove the bracket and two lockwashers (22) from the dust cover

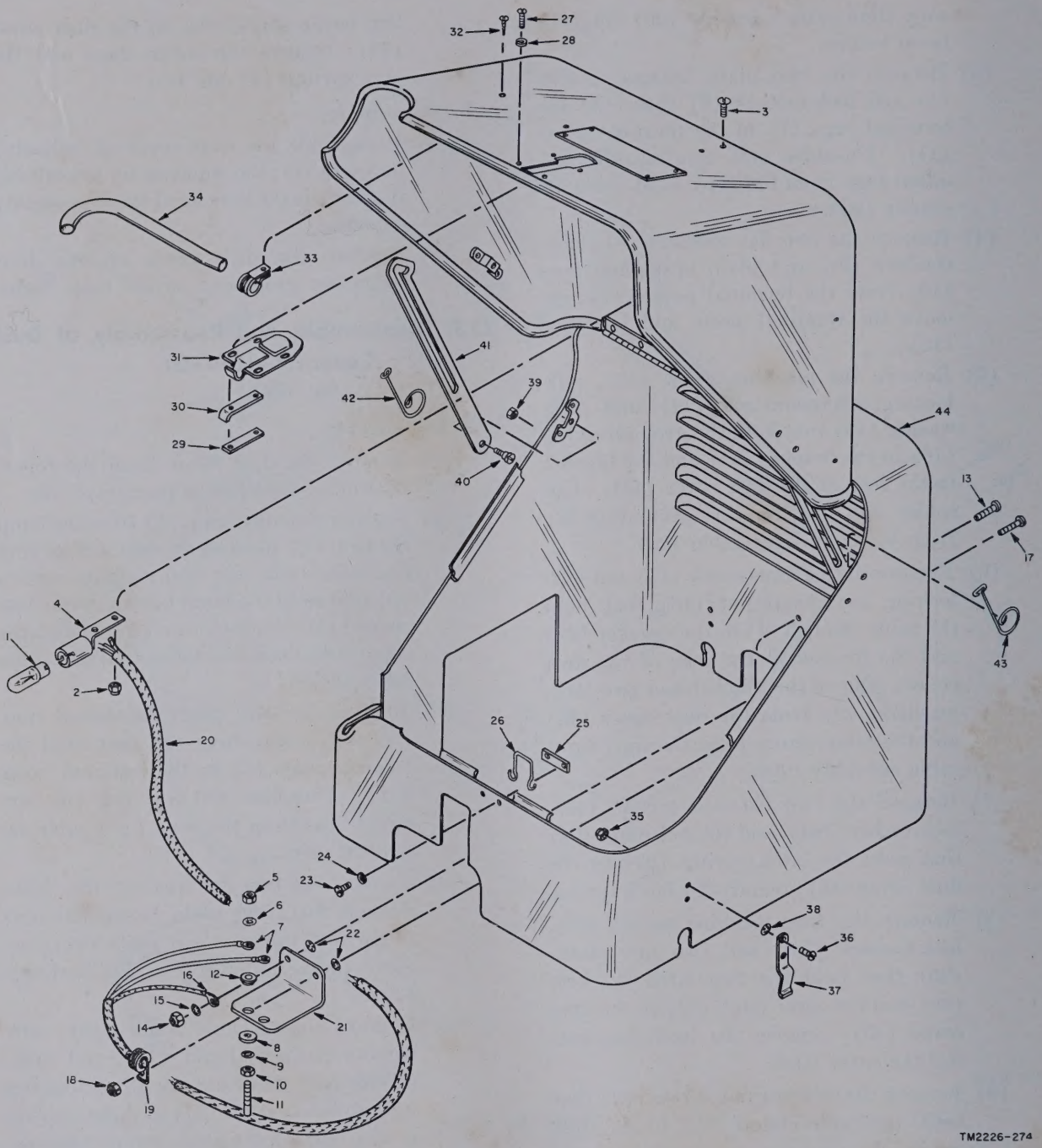


Figure 174. Dust cover, exploded view (TT–109/FG).

and the cable clamp from the copy light cable assembly (20).

(7) Remove the two machine screws (23), lockwashers (24), and nut plate (25) that hold the latch spring (26) to the dust cover (44); remove the latch spring.

(8) Remove the four machine screws (27), lockwashers (28), and two nut plates (29) that hold the two latch brackets (30) and the cover latch (31) to the dust cover (44); remove the latch bracket and the cover latch.

(9) Remove the self-tapping screw (32) that holds the clamp (33) to the dust cover (44); remove the clamp from the copy light director (34). Remove the copy light director.

(10) Remove the eight self-locking hexagonal nuts (35) and machine screws (36) that hold the four springs (37) to the dust cover (44); remove the four springs and eight lockwashers (38).

(11) Remove the four self-locking hexagonal nuts (39) and studs (40) that hold the two cover stays (41) to the dust cover (44); remove the cover stays and the stay springs (42 and 43).

b. Reassembly.

(1) Reassemble the dust cover as indicated in figure 174; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the dust cover on the four mounting grommets of the base frame.

Section V. SPRING DATA

214. General

a. Paragraphs 215 through 218 contain data on the coil springs used in Teletypewriter Reperforator TT–107(*)/FG and TT–109/FG. This information is useful when inspecting or overhauling the equipment to determine which springs must be replaced. It is also useful as a check list when assembling, adjusting, or troubleshooting, and as a means of identifying springs.

b. The charts in paragraphs 215 through 218 give the dimensional and strength characteristics required of each spring used in the reperforator. Each type of spring is illustrated in figures 175 through 178. The free length is measured between the inside surfaces of the end hooks. If a spring fails to pass its strength check, it should be replaced.

Note. In some cases, spring tensions are indicated in grams for more accurate adjustments than are normally possible with an ounce measurement scale. If a gram scale is not available, an ounce scale may be used if the following relationship is considered. One ounce is equal to 28.35 grams.

---

1 Copy lamp, 20701
2 Self-locking hexagonal nut, 10500
3 Machine screw, 10393
4 Lamp holder, 51115
5 Plain hexagonal nut, 10515
6 Lockwasher, 10404
7 Terminal lug, 20707
8 Flat washer, 51481
9 Lockwasher, 10404
10 Plain hexagonal nut, 10515
11 Terminal post, 55022
12 Bushing, 51106
13 Machine screw, 10357
14 Self-locking hexagonal nut, 10500
15 Lockwasher, 10403
16 Grounding lug, 20379
17 Machine screw, 10357
18 Self-locking hexagonal nut, 10500
19 Cable clamp, 20515
20 Copy light cable assembly, 57623A (includes items 4, 7, and 16)
21 Bracket, 54227
22 Lockwasher, 10403
23 Machine screw, 10393
24 Lockwasher, 10429
25 Nut plate, 52661
26 Latch spring, 57177
27 Machine screw, 10124
28 Lockwasher, 10435
29 Nut plate, 57179
30 Latch bracket, 57176
31 Cover latch, 57175A
32 Self-tapping screw, 10379
33 Clamp, 20500
34 Copy light director, 52744
35 Self-locking hexagonal nut, 10500
36 Machine screw, 10393
37 Spring, 57622
38 Lockwasher, 10403
39 Self-locking hexagonal nut, 10500
40 Stud, 56206
41 Cover stay, 52694
42 Stay spring, 57169
43 Stay spring, 57168
44 Dust cover, 57620A (includes all items except 1, 32, 33, and 34)

Figure 174—Continued

215. Crossed-End Spring Data

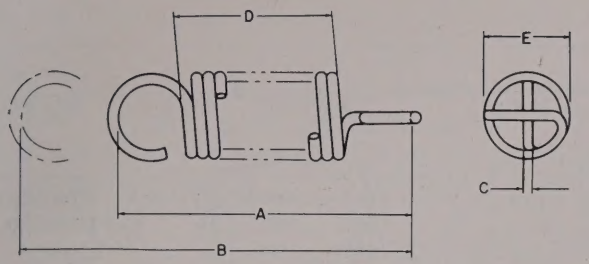
(A, fig. 175)

Reference No.	Name	A Free length (in.)	B Extended length (in.)	Required tension, extended length	C Wire thickness (in.)	D Number of coils	E Diameter (in.) OD
50904	Transfer lever trip latch	11/16	13/16	2½ oz, ±¾ oz	.012±.0003	33¾	.156
50912	Reel support latch	½	21/32	17½ oz, ±1½ oz	.018±.0005	12¾	.156
52161	Type wheel bell crank lever	1 3/32	1 3/8	4½ to 5 oz	.016±.0003	45	.187
52167	Type wheel reciprocating lever.	23/32	13/16	30 to 36 oz	.033±.0005	8	.250
52169	Letters sensing levers	13/16	1	33 to 36 oz	.022±.0003	26¼	.141
52171	Figures sensing levers	15/16	1 3/16	26 to 30 oz	.020±.0003	33	.141
52173	Bell sensing lever	13/16	1	24 to 28 oz	.020±.0003	28	.141
52212	Lever latch	5/8	¾	36 to 44 grams	.010±.0003	27	.156
52602	Ribbon feed cam follower	13/16	1	33½ oz, ±1½ oz	.025±.0003	19	.197
52604	Ratchet feed detent	11/16	⅞	1⅜ oz, ±⅛ oz	.009±.0003	48¾	.125
53141	Latching lever stop	½	5/8	.70 oz, ±.2 oz	.008±.0003	26	.141
53283	Ratchet pawl	13/32	½	½ to 1 oz	.022±.0005	14	.125
53312	Lever latch	19/32	¾	3¼ to 3¾ oz	.012±.0003	———	.141
53569	Code-ring locking bail cam follower.	15/16	1 11/32	11 oz, ±1 oz	.018±.0003	32	.191
55009	Y-lever detent	¼	.342	90 to 130 grams	.009±.0003	12¾	.083
57394	Alarm lever	1 11/16	2 ½	9 oz ±.9 oz	.0180±.0003	76	.185

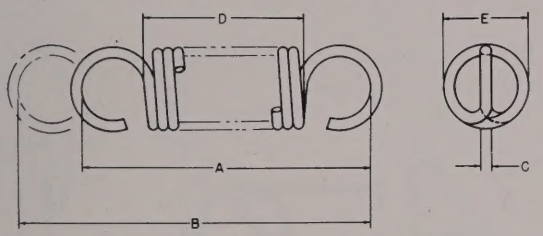
216. Parallel-End Spring Data

(B, fig. 175)

Reference No.	Name	A Free length (in.)	B Extended length (in.)	Required tension, extended length	C Wire thickness (in.)	D Number of coils	E Diameter (in.) OD
50334	Governor adjusting	15/16	1	32 oz, ±3 oz	.026±.0005	26½	.156
50903	Transfer lever	1 3/32	1¼	5 lb 13 oz, ±3 oz	.042±.0005	14	.281
52163	Register lever	⅞	1 1/16	18 to 22 oz	.025±.0003	16½	.250
52164	Feed pawl	19/32	¾	10 oz ±½ oz	.016±.0003	19	.156
52166	Detent lever	7/16	½	25 oz, ±2 oz	.020±.0003	10¼	.156
52168	Figures-letters lever	1¼	1 7/16	3½ oz, ±¼ oz	.012±.0003	74	.125
52266	Switch operating lever	5/8	13/16	11 to 13 oz	.018±.0003	15	.187
52576	Alarm lever	3 13/16	4 3/16	18 to 22 oz	.025±.0003	140	.197
52603	Ribbon retainer lever	5/8	1	2¼ to 2¾ oz	.012±.0003	27	.165
53139	Tape feed-out operating arm	27/32	1⅛	9 to 11 oz	.020±.0003	———	.250
53140	Latching lever	27/32	1	7 to 9 oz	.020±.0003	———	.250
53148	Latch spring	9/16	5/8	12 to 14 oz	.022±.0003	———	.187



A. CROSSED - END SPRING



B. PARALLEL - END SPRING

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Figure 175. Crossed-end and parallel-end springs.

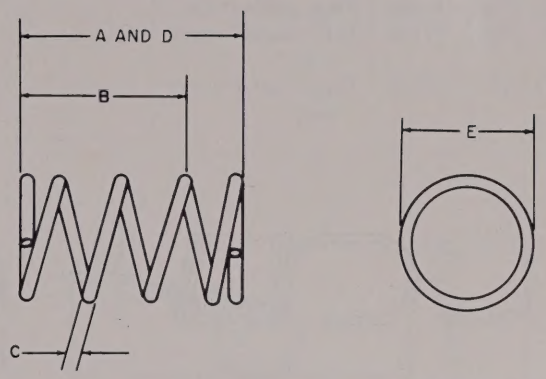

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Figure 176. Extension spring.

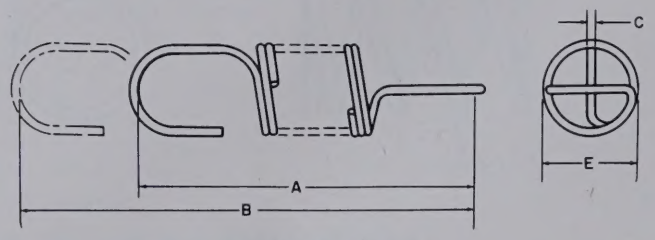
217. Extension Spring Data

(fig. 176)

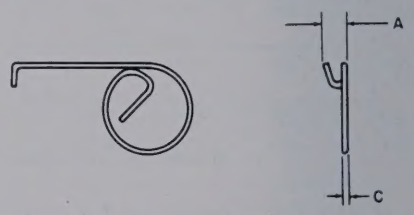
Reference No.	Name	A Free length (in.)	B Operated length (in.)	Required tension, extended length	C Wire thickness (in.)	D Number of coils	E Diameter (in.)
50847	Friction clutch	½ ± 1/32	9/32	10 lb, ±8 oz	.053 ± .0005	4	.453 ID
50848	Sliding clutch	¾ ± 1/16	7/16	28 oz, ±3 oz	.041 ± .0005	5½	.578 ID
50910	Friction plate	17/32	5/16	32 oz, ±3 oz	.028 ± .0005	6½	.250 ID
50914	Friction clutch	13/32	9/32	6 lb, ±10 oz	.049 ± .001	4½	.390 ID
51593	Contact plunger	⅝ ± 3/64	5/16	7 oz, ±1 oz	.012 ± .0003	11	.125 ID
51855	Governor adjusting pressure.	⅝ ± 1/32	.047		.014 ± .0003	6	.240 OD
52940	Stop bar lever	37/64 ± 1/64	.375	8 oz, ±½ oz	.016 ± .0003	11½	.183 OD
53256	Holding clip detent	17/32	⅜	9 to 11 lb	.028 ± .0005		.141 OD
54932	Friction clutch	13/32	9/32	6 lb, ±10 oz	.067 ± .0001	3½	.6875 ID
56091	Selector magnet cover	5/16 ± 3/64	.100		.012 ± .0003	5	.125 ID
56249	Friction clutch	½ ± 3/64	9/32	10 lb 8 oz, ±8 oz	.076 ± .001	3½	.891 ID
57391	Release plunger	1	9/16	1¼ oz, ±¼ oz	.010	11½	.194 ID

218. Special Spring Data

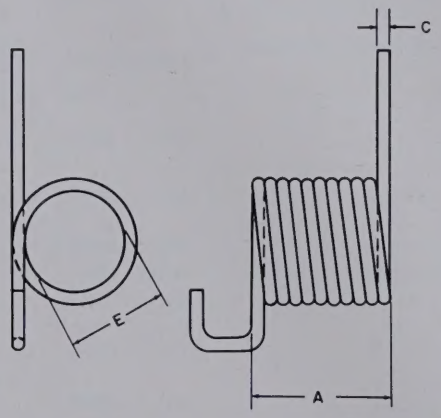
Figure No.	Ref. No.	Name	A Free length (in.)	B Extended length (in.)	Required tension, extended length	C Wire thickness (in.)	D Number of coils	E Diameter (in.)
A, 177	50902	Selector lever	1	1¼	8 oz, ±1 oz	.012 ±.0003	55 max	0.085 OD.
B, 177	52422	Tape retainer	⅜			.033 ±.0005	10	0.265 ID.
C, 177	53888	Right hand cover	¼			.0625±.0005	1	
D, 177	53889	Left hand cover	¼			.0625±.0005	1	
A, 178	55674	Transfer lever	1³²⁄₃₂	1¼	3¾ lbs, ±4 oz	.035 ±.0005	14	9⁄32 OD.
B, 178	56396	Tape guide lever			35 grams±10 grams	.012 ±.0005	3	0.258 ID.
C, 178	57168	Left hand cover stay.				.063 ±.001	1	15⁄16 OD.
D, 178	57169	Right hand cover stay.				.063 ±.001	1	15⁄16 OD.



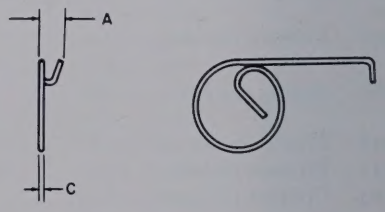
A. SELECTOR LEVER SPRING



C. RIGHT-HAND COVER SPRING



B. TAPE RETAINER SPRING



D. LEFT-HAND COVER SPRING

TM2226-277

Figure 177. Selector lever, tape retainer, and cover springs.

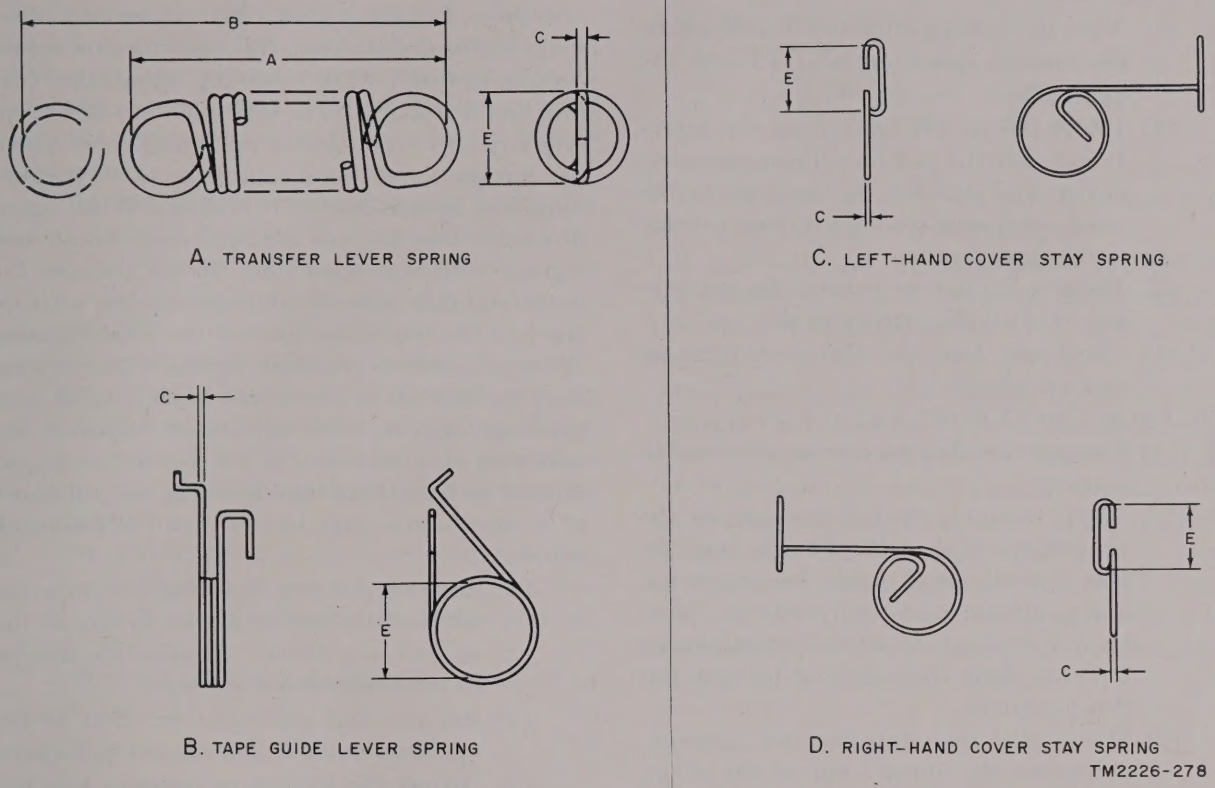


Figure 178. Transfer lever, tape guide lever, and cover stay springs.

Section VI. FINAL TESTING

219. General

Teletypewriter Reperforator TT–107(*)/FG or TT–109/FG should meet certain performance requirements before being returned to operational service. Paragraphs 220 and 221 describe the procedures of final testing of the operational limits of the reperforator.

220. Test Sets

The equipment used most frequently for reperforator final testing at the field maintenance level is described briefly below.

a. Test Set TS–2/TG. This test set (fig. 134) is a portable, motor-driven unit which transmits test signals of controlled distortion. It is normally used to test the operational limits of teletypewriter receiving mechanisms with distorted signals supplied from the test set. Test signals are provided with either marking or spacing bias and marking or spacing end distortion. Bias and end distortion in the test signals are adjustable from 0 to 50 percent. Four test signals (R, Y, space, or test message) can be transmitted continuously by this test set. TM 11–2208, Test Sets TS–2/TG, TS–2A/TG and TS–2B/TG, contains detailed information on the use of this set.

b. Distortion Test Set TS–383/GG. This test set (fig. 135) is a motor-driven set used for analyzing distortion in signals transmitted by a teletypewriter and, like Test Set TS–2/TG, for testing the effects of distortion on receiving mechanisms. Test Set TS–383/GG is normally used in the larger repair shops. A test message or the code groups for the letters Y, T, O, M, V, R, BLK (blank), and LET (letters) can be transmitted with controlled distortion for testing the operational limits of selector mechanisms. Distortion can be controlled from 0 to 100 percent. TM 11–2217, Distortion Test Sets TS–383/GG and TS–383A/GG, gives detailed information on the use of this test set.

221. Reperforator Test

a. Preparation.

(1) Turn the motor switch to ON and adjust the motor speed on the TT–109/FG (par. 15).

(2) Insert the receive cord from the reperforator into the jack on a line terminating device and connect the test set to the same equipment to supply line current to the reperforator.

(3) Prepare the test set to send the test message with undistorted signals.

(4) Check the tape for incorrect printing and punching.

b. Range Test (TT–107/FG).

(1) Connect the reperforator as described in *a* above.

(2) While receiving the test message, set the rangefinder dial at 60. Slowly turn the bias potentiometer knob for maximum and minimum good copy positions. Note the dial reading and set the potentiometer 5 points above the midpoint between the two readings.

(3) While still receiving the test message, determine the upper limit of the range with the rangefinder dial.

(4) After the upper limit is established, determine the lower limit.

(5) Calculate the difference between the upper and lower limits. This difference (range of the reperforator) should be at least 72 units on the dial.

(6) Set the rangefinder dial at the midpoint between the two limits. Tighten the rangefinder dial lock.

c. Range Test (TT–107B/FG).

(1) Connect the reperforator as described in *a* above. Arrange the test set to transmit the test message with undistorted signals.

(2) Connect a milliameter in series with the bias circuit (fig. 130).

(3) Loosen the lock nut on the shaft of the bias potentiometer and turn the shaft with a screw driver until a reading of 8.75 ma is obtained for 20-ma operation or a reading of 12.25 ma is obtained for 60-ma operation. Tighten the lock nut and check the adjustment.

(4) Remove the milliameter from the circuit.

(5) Complete the range test as described in *b*(3) through (6) above.

d. Bias Tolerance Test. Within certain minimum limits of distortion, this reperforator should operate properly while receiving signals that contain bias distortion. The bias tolerance of a properly adjusted reperforator operating at 60 words per minute should be a minimum of 40 percent, computed as described in (5) below. When signal distortion test sets are arranged to transmit test signals with bias distortion, the set changes the beginning time of each marking impulse with respect to the beginning time of the start impulse. When adjusted to transmit signals with *marking bias*, the test set *advances* the *beginning* of each marking impulse, when adjusted to transmit signals with *spacing bias*, the set *retards* the *beginning* of each marking *impulse*. The bias tolerance of a reperforator may be tested in the following manner:

(1) Interconnect the reperforator and a distortion test set in a test circuit as described in *a* above. Prepare the test set to transmit the test message.

(2) Set the bias potentiometer dial at the optimum point as determined in *b* above.

(3) Adjust the test set to transmit test signals with a *marking* bias of 35 percent. Use these test signals to determine the upper range limit with the rangefinder.

(4) Adjust the test set to transmit test signals with 35 percent *spacing* bias. Determine the lower limit of the range.

(5) Compute the bias tolerance of the reperforator by using the following formula:

$$\text{Bias tolerance} = 35 + \left(\frac{\text{Upper limit—Lower limit}}{\text{marking bias—spacing bias}} \right)$$

Note. The bias tolerance of a properly adjusted reperforator operating at 100 wpm should be 35 percent.

e. End Distortion Test. The reperforator should operate properly while receiving signals containing end distortion within certain minimum limits. The end distortion tolerances of a properly adjusted reperforator operating at 60 words per minute should be a minimum of 35 percent. When signal distortion test sets are arranged to transmit test signals with end distortion, the set changes the ending time of each marking impulse with respect to the beginning time of the start im-

pulse. When adjusted to transmit test signals with *spacing* end distortion, the test set *advances* the *end* of each marking code impulse. When adjusted to transmit test signals with *marking* end distortion, the test set *retards* the end of each marking code impulse. The end distortion tolerance of a reperforator may be tested in the following manner:

(1) Interconnect the reperforator and a distortion test set in a test circuit as described in *a* above. Prepare the test set to transmit test message signals.

(2) Set the bias potentiometer at the optimum point as determined in *b* above.

(3) Adjust the test set to transmit test signals with 35 percent spacing end distortion. Use the test signals to determine the upper range limit with the rangefinder.

(4) Adjust the test set to transmit test signals with 35 percent marking end distortion. Determine the lower limit of the range.

(5) Compute the end distortion tolerance of the reperforator using the following formula:

End distortion tolerance =

$$35 \times \left[\frac{\begin{matrix}\text{Upper limit} \\ \text{spacing end} \\ \text{distortion}\end{matrix} - \begin{matrix}\text{Lower limit} \\ \text{marking end} \\ \text{distortion}\end{matrix}}{2} \right]$$

Note. The end distortion of a properly adjusted reperforator operating at 100 wpm is 30 percent.

f. Internal Bias. Internal bias of a reperforator receiving unit is a computed measurement of the effect of maladjustment, wear, or some other mechanical fault within the mechanism. The internal bias of the reperforator is found by calculating the difference between the bias tolerance orientation point (midpoint between the high and low range limits (*c* above)) and the end distortion orientation point in (*d* above). If the difference between the two orientation points at 60 words per minute operation is greater than 6 points, some mechanical fault is present in the reperforator and the mechanism should be checked for maladjustment or other mechanical fault.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

222. Disassembly

Prepare Teletypewriter Reperforator TT–107(*)/FG or TT–109/FG for storage in the following steps:

a. Disconnect the signal and power cords from the reperforator.

b. Remove the chad bin.

c. Remove the roll of paper tape from the tape reel.

d. Remove the screws, plain washer, lockwashers, and nuts which hold the reperforator to the mounting table or shelf; remove the reperforator.

223. Repacking for Shipment and Limited Storage

a. If the original packing materials are on hand, use them and reverse the unpacking sequence given in paragraph 10. General repacking information is usually available at depots.

b. The prime requirement is to pack the equipment to prevent damage during transit or limited storage. Package the equipment securely and use sufficient wadding to lessen the effects of severe jolting. Make sure that the equipment is protected from rain or snow.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

224. General

Demolition of the equipment will be accomplished only upon the order of the commander. The demolition procedures outlined in paragraph 225 will be used to prevent the enemy from using or salvaging the equipment.

225. Destruction of Components

a. Smash. Smash the reperforator, covers, frames, accessories, controls, switches, and all parts; use sledges, crowbars, axes, handaxes, pickaxes, hammers, or heavy tools.

b. Cut. Cut all cords and wiring; use axes, handaxes, or machetes.

c. Burn. Burn technical manuals, circuit labels, diagrams, resistors, coils, capacitors, cords and wiring; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Explode. If explosives are necessary, use firearms, grenades, or TNT.

e. Dispose. Bury or scatter the destroyed parts in slit trenches, foxholes, or throw them in streams.

f. Destroy. Destroy everything.

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Note. Items in this index which refer to the TT–107B/FG are also applicable to the TT–109/FG unless otherwise noted.

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For explanation of abbreviations used, see SR 320–50–1.

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